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BUSINESS GEOGRAPHY

By Ellsworth Huntington and Frank E. Williams, Professor of Geography and Industry, University of Pennsylvania. With the coöperation of Robert M. Brown and Miss Lenox E. Chase. Second Edition, Rewritten. 616 pages, $5\frac{1}{2} \times 8\frac{1}{2}$, 155 figures. Cloth, $3.50 net. John Wiley & Sons, Inc., New York.

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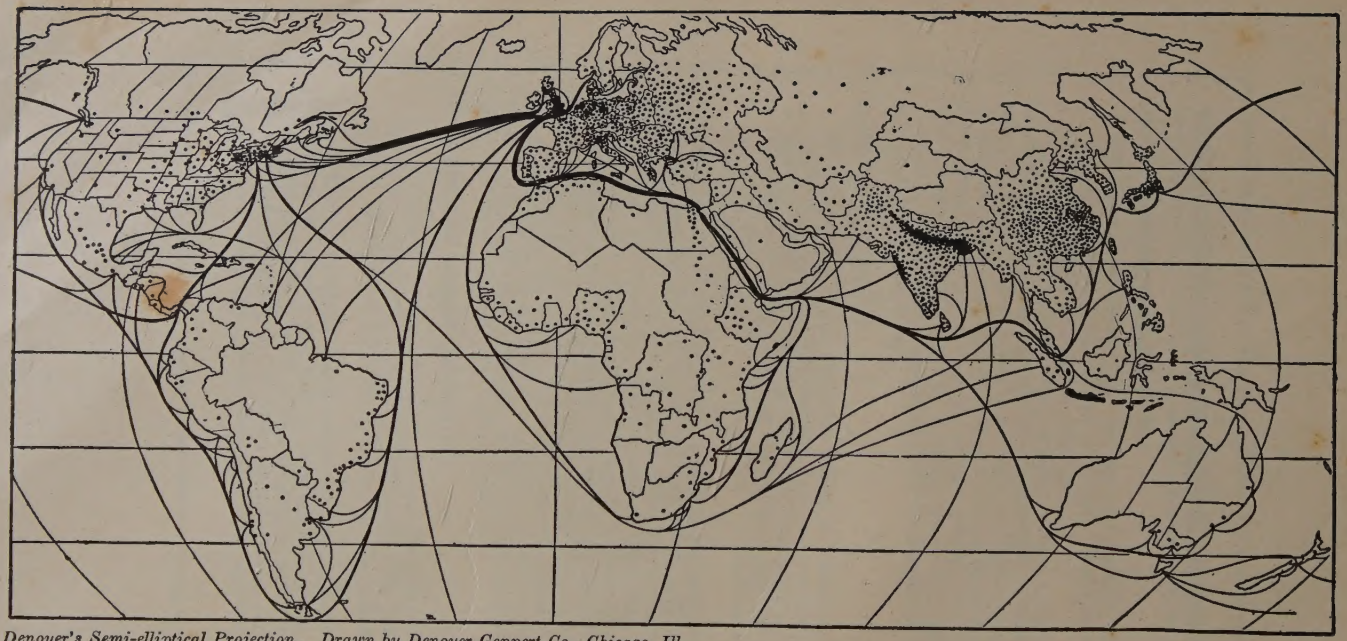

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 1.—World Map of Population and Trade Routes.

Each dot represents 1,000,000 persons.

BUSINESS GEOGRAPHY

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PREFACE

Plan and Scope of Book.—Physical environment appears to rank with biological variations and cultural inventions as a primary determinant in the evolution of human capacities, activities, occupations, productivity, and progress. As a determinant of the *distribution* of all these human conditions, physical environment appears to overshadow all other causes. Such distribution is the main field of the science of geography. The first step in this growing science is to understand the principles which govern the distribution of living beings, and of their varying qualities. Hence Part I of this book shows how climate, relief, soil, minerals, and other physical conditions influence the distribution of plants, animals, and man, and especially of man's activities in the business of getting a living. Man is the main theme of Part I.

Part II takes products as its main theme. It tells where the main products are produced, and why they are abundant in special regions. Since each great product, as well as each type of physical environment, fosters particular types of human activity, Part II also discusses a few of the more prominent types of communities, types which in modified forms exist in many lands and among widely diverse races. The study of principles, products, and types of communities prepares the way for a regional study of the United States, Part III, and of the world, Part IV. The statistical ground work for all the preceding parts is summed up in the tables of Part V.

The present edition of *Business Geography* is practically a new book, the first half, in fact, being entirely new. It differs markedly from its predecessor in many respects: (1) It is more completely adapted to college students than was the First Edition. (2) The treatment of relief, soils, and minerals has been expanded, so that they receive proportionally as much attention as climate. (3) New tables of production have been prepared and are used extensively for comparing the productivity of different regions. (4) Several new chapters have been added on the distribution of the world's chief products. (5) Maps and diagrams have been added in large numbers. The majority are new, having been constructed from the latest data especially for this book. (6) The

misleading Mercator Projection has been eliminated. The disadvantages of a split projection, especially in showing trade routes, have led to the adoption of Denoyer's semi-elliptical projection. On this projection the Denoyer-Geppert Company of Chicago has prepared over thirty world maps of production, etc., largely on the basis of new data supplied by the authors in the form of four-year averages for 1920–23, as given in the Appendix. (7) All photographs have been omitted. The authors believe that for mature students a good map is generally of more value than a photograph. (8) The descriptive material pertaining to the United States has been largely expanded. (9) The tables in the Appendix have been extensively revised and brought up to date. New items have been added, especially in relation to minor products and international commerce. The tables are referred to in the text much more than before, thus enlarging their usefulness. The provinces of Canada have been included on the same basis as the states of the United States wherever possible. (10) The exercises at the ends of the chapters have been revised. The proportion that can be performed by the individual student in a relatively short time has been increased.

Acknowledgments.—In preparing the Second Edition, the authors have been greatly indebted to the numerous and illuminating suggestions of Leonard S. Austin, of Los Angeles, Dr. O. E. Baker of Clark University and the U. S. Department of Agriculture, Dr. R. M. Harper of the Geological Surveys of Alabama and Florida, Professor Carl O. Sauer of the University of California, and Professor S. S. Visher of Indiana University. Numerous Government officials, mainly in the Departments of Agriculture, Labor, Commerce, and the Interior, have shown unfailing courtesy and discrimination in supplying data not otherwise accessible. Special mention should be made of the following:

A. *Government Bureaus:* Bureau of the Census; Coal Division, Department of Commerce; Forest Service; Geological Survey; Bureau of Plant Industry.

B. *Individuals in Government Bureaus who have made special contributions:* G. B. L. Arner, Bureau of Agricultural Economics; Joseph A. Becker, Bureau of Agricultural Economics; John S. Buckley, Bureau of Animal Industry; E. Dana Durand, Bureau of Foreign and Domestic Commerce; L. C. Grey, Bureau of Agricultural Economics; Julius Klein, Bureau of Foreign and Domestic Commerce; C. F. Marbutt, Bureau of Soils; Lawrence Martin, Library of Congress; A. G. Rice, Bureau of Soils; M. A. Schnurr, Bureau of Reclamation; Ethelbert Stewart, Commissioner of Labor Statistics; Helen M. Strong, Bureau of Foreign and Domestic Commerce; Milton Whitney, Bureau of Soils.

C. *Canadian Government Bureaus:* R. H. Coats, Dominion Statistician of Canada; T. C. C. Lynch, Natural Resources Intelligence Service, Canada.

D. *Individuals and organizations which have supplied illustrations and statistics:* S. L. Andrew, American Telegraph and Telephone Company; F. J. Fell, Pennsylvania Railroad System; Frank Leverett, Geologist; Paul O. Nyhus, Wisconsin Department of Agriculture; J. E. Spurr, Editor Engineering & Mining Journal Press; A. J. Surett, Illinois Co-operative Crop Reporting Service; Glen H. Trewartha, University of Wisconsin.

E. *Publishers and magazines that have supplied illustrations:* Economic Geography; McGraw-Hill Book Company; Yale University Press.

SUGGESTIONS TO TEACHERS

Exercises and Maps.—Judging by the experience of a large number of teachers who have used the First Edition of this book, a careful working out of the problems, which means an intensive study of the tables, gives a surprising amount of new information, and shows that many widely held ideas are not supported by the facts. In this connection the authors strongly recommend that all students *make many maps and keep them in an orderly file for reference.* The drawing of the maps is usually interesting work, and is perhaps the best way of fixing the facts in the memory. Moreover, it brings out the main purpose of geography, namely an understanding of where products, activities, and so forth are located, how they are related to the physical environment, how those in one region compare with those in another, and how the general condition of a country or state, its "regional aspect" depends on the interplay of a great number of factors each of which may influence many or all of the others. Only by putting the facts on maps and comparing one map with another can these relationships be grasped, or can a well-rounded view of a given region be obtained.

A large supply of desk maps, especially of the United States, the World (large size), and Europe, should always be on hand. Those showing relief in an inconspicuous color and having tinted oceans (as in the series of the Denoyer-Geppert Company, Chicago, Ill.), are especially desirable because the material inserted by the students is in no danger of being confused with black lines on the original map, and the relations of all sorts of products and activities to relief and the oceans are apparent at a glance.

An up-to-date commercial atlas is of the utmost importance, both in studying the text and in solving the problems. The best on the market is *Putnam's Economic Atlas* (Putnam's Sons, New York City). Good wall maps are likewise important. In addition to the regular political maps, there should be maps showing relief, rainfall, temperature, vegetation, and density of population. Philips' *Comparative Wall Atlas* provides an excellent series along this line (American distributors, Denoyer-Geppert Company). These should be supplemented by maps of products, industries, and transportation routes. Such maps are published by various companies, or can be made by the pupils and

teacher on large outline maps, thus building up a very valuable collection. The Finch series (J. Nystrom Company, Chicago) is excellent. It is a good plan to hang a few maps where the class cannot avoid looking at them, and then change the maps at frequent intervals according to a definite scheme of rotation. If the teacher judiciously calls attention to the relationships determining his choice of maps, the students unconsciously absorb a great amount of information.

Types of Problems.—The possible problems are far more numerous than those given in the book. The teacher and the students can devise a great many quite as good as those here given. Some of the chief types are as follows:

1. Maps showing actual distribution of population, production, activities, etc. One way to make these is to have a small dot of a given size represent a given amount, as in Fig. 1 and many other maps scattered through the book. This, however, requires so much time and information that it is often better to follow the method illustrated in Fig. 124. There a shaded oblong, ▬, represents twenty million; a smaller oblong, ▬, ten million; a solid triangle, ▲, five million; and an open circle, ○, one million or less. The symbols may represent other amounts according to the nature of the data, and their relative values may be as here, or otherwise, as 20, 10, 4, 1. In general, the amount represented by each symbol should be such that the largest symbol will represent from 2 to 10 per cent of the total. Place the symbols as nearly as possible in the part of the country or state where the product or activity is actually found (see Fig. 124). Such maps give a clear idea of the distribution and intensity of activities and production. It is often advisable to construct a series of related maps using symbols of the same value; for example, a series may be drawn showing all the cereals, the animals, the metals, and so forth.

2. Where percentages, prices, or figures per capita or per square mile are given, or in other cases where the figures do not represent the total amount, one of the best methods is to insert the figures on an outline map, then draw what are known as isopleths, or lines showing equal degrees of activity just as isotherms show equal degrees of temperature. Then apply heavy shading to the areas of greatest intensity, and lighter shades to the areas of progressively less intensity. See Figs. 2, 20, 21, and 31. The map should be accompanied by a written explanation of the conditions which determine the geographical distribution of the activity in question. Various states and countries should be compared with the home region, and with one another, and the reasons for differences should be pointed out. Each map should be compared with others showing physical conditions or other activities and products.

3. A third general type of exercises is to prepare tables showing how a given **area** or country compares with one or more other areas, in many different respects. Discuss the nature of the differences and their reasons. Bar diagrams like Fig. 28 are often a help in such comparisons. Such diagrams are an admirable and easy way of illustrating many kinds of facts (see Figs. 7, 33, 49, 52).

4. A given *product* may also be followed from table to table. For example, its conditions of production, i. e., relief, soil, climate, method of cultivation, and so forth, may be compared with the yield per acre, the yield per person, the percentage of the world's production in a given country, or the extent to which it is exported or consumed.

5. A given *physical condition*, such as relief, climate, or the position of a state or country, may be taken as the basis, and its effect may be studied in a series of maps. For example, the influence of the Appalachian Mountains can be detected in many different sets of data, including those for minerals, agricultural products, transportation, finance, etc., as appears in Figs. 45, 70, and 92. Here, as elsewhere, the conditions near home should be the starting point, and should be continually kept in mind as one proceeds to remoter regions.

Use and Sources of Tables in Part V.—Parallel tables for the countries of the world and for the states and provinces of the United States and Canada have been given wherever possible. It is often advisable to work out the same problem on the basis of both kinds of tables. As a general rule, it is well to use the home state and the United States as the basis of comparison, even when directions to this effect are not given in the exercises.

In using the numbers in the tables, *decimals may often be omitted, or only the figures for thousands or millions may be employed.* In all such cases, if the omitted portion amounts to five-tenths or more of the amount which is reckoned as 1, it should be counted as equal to 1.

The tables are derived mainly from the sources indicated on page 505. In some cases the data are taken directly from the original publications; but more often they have been recalculated in order to get averages for several years, or to reduce them to a percentage, per capita, per acre, or per square mile basis and thus facilitate geographical comparisons. In most cases the necessary calculations have been made with a slide rule, hence the tables are exact only to the third figure. The data cover practically all the fields of business; but statistics for manufacturing outside the United States and for internal commerce in all countries are omitted, because they are not available, or because they have been compiled on such diverse systems that accurate comparisons are impossible.

Special attention is called to the indexes of illustration and tables.

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BUSINESS GEOGRAPHY

PART I

GEOGRAPHIC FACTORS AND PRINCIPLES

CHAPTER I

THE NATURE OF BUSINESS GEOGRAPHY

The Science of Geography.—Geography is the science which describes and maps the phenomena of the earth's surface for the purpose of discovering how the distribution of one set of phenomena is related to that of others. Its foundations are the distribution of physical features like oceans, continents, land forms, soils, minerals, and climate. These features, together with the reactions of plants and animals upon one another, control the natural distribution of plants and animals, as they gradually migrate from the limited areas where they originate to the broad areas which they occupy when a given type becomes old. The same principles apply to the distribution of human characteristics such as complexion, stature, occupations, modes of life, health, energy, and even character and achievements. New types may arise anywhere, but they persist only under definite geographical conditions, and spread to new regions and become permanently established only when both the physical and organic features of the geographical environment permit.

This great science of geography obviously consists of two main parts, *physiography*, dealing with the distribution of physical features, and *ontography*, dealing with the distribution of living beings and their characteristics. Physiography examines the distribution of oceans, continents, mountains, plateaus, plains, valleys, rivers, lakes, rocks, minerals, soils, temperature, atmospheric pressure, winds, clouds, rainfall, and the like. It not only describes these features and tells *where* they are located, but discovers *why* they are located on certain

parts of the earth's surface, and *how* the distribution of any one type of phenomena, such as soils, is related to the distribution of other phenomena.

Ontography does the same for all sorts of phenomena pertaining to life. Its subject matter ranges from bacteria through plants and animals to man, and includes all the activities of every species, regardless of whether those activities are physiological, intellectual, or moral. But neither physiography nor ontography describes these various phenomena as an end in itself,—merely as a means toward explaining their distribution. The chemical character of a soil is not in itself geographic, but the chemical *differences* between soils in desert plains, forested tropical mountains, and glaciated plateaus, are a part of geography. That science must explain how relief, climate, vegetation, and other factors cause soils to differ from region to region. Such subjects as the growing of rye, the making of tinware, the status of education, and the quality of honesty do not belong to geography any more than to other sciences. They become subjects of geographic study when their distribution is explained by such conditions as the quality of the soil, the location of mineral deposits, the capacity of a region to produce food, the physical conditions which have directed the migrations of people and ideas, and a host of other factors. In a word, the keynote of geography is the explanation of the *distribution* of all sorts of phenomena so far as that distribution depends directly or indirectly upon the earth's physical features.

The Meaning of Business Geography.—Ontography consists of three main branches: (1) phytogeography, *phytography*, or plant geography; (2) zoogeography, *zoography*, or animal geography; and (3) anthropogeography, *anthropography*, or human geography. Human geography not only attracts more interest than any other phase of the subject, but demands a knowledge of the others because it depends upon them. It is subdivided into several branches whose function is described by such adjectives as political, commercial, industrial, economic, racial, medical, regional, and the like. Most of these divisions are not clearly defined, or at least overlap a great deal. Thus, a really adequate account of the geography of industries is impossible without a discussion of the geography of commerce, of economic resources, of political relationships, and of racial characteristics. This book deals with a phase of geography somewhat different from any of those mentioned above. Business is defined by the *Century Dictionary* as: ". . . Specifically, that which busies or occupies one's time, attention and labor as his chief concern; that which one does for a livelihood; occupation; employment." Hence business geography is the geography

of the methods by which people get a living. It includes all that is included in industrial, commercial, and economic geography, and some things which pertain to political, racial, and medical geography. Business geography also includes part of regional geography, for it requires a study not only of the distribution of individual methods of getting a living, but of the inter-relationships of all methods in any given region.

A Simple Example of Business Geography.—Here is a simple example of business geography. It represents the actual experience of a young man who started a general store in a pioneer Minnesota village. His friends thought he would fail because another store already handled the small business of the community. He looked over the geographical conditions, however, and went to work.

Here are the conditions: The country for miles around the village was a level plain; the soil deep and fertile; the climate fairly cool and invigorating, too cool for corn but excellent for potatoes, grass, and cattle raising. The plain was covered with a mixed forest of pine and hardwood except around a lumber camp where the trees had been cut for a steam mill near the village. In isolated clearings a handful of farmers had settled, and were pasturing cattle on a fine growth of short sweet grass in the cleared areas not needed for crops. Transportation was difficult. Through the village, to be sure, ran a railroad, but there were no good roads, nothing but lumber trails and cart paths. One other feature completes the geographical picture, namely, a number of pretty glacial lakes full of fish and surrounded by woods where game was still abundant. If the young man had put his thoughts into the language used in this book he would have said that his problem centered around four communities: (1) a lumber mill with its shifting, irresponsible population; (2) a few farmers; (3) a tiny commercial village near a railroad station; and (4) occasional campers on the shores of the lakes.

The proprietor of the old store was content to carry chiefly the staple goods such as bacon, sugar, flour, and clothing. The rough clothing and especially the heavy boots and shoes used by the men in the mill formed a large part of his sales. The proprietor of the new store realized that he must cater somewhat to the millmen, but that the geographical conditions would some day produce a farming community. The lumber would be cut, the mill would shut down, and the cleared land would be taken by farmers. The farmers were indeed poor; they could purchase little, and had only a small surplus for the market. Even that little they had much difficulty in bringing to the railroad because of the bad roads. They were reliable, however,

because their homes were permanent, and the storekeeper could safely give them credit. On the other hand, the workers in the mill had cash and were good spenders; but they were likely to quit their jobs and leave their bills unpaid.

So the new storekeeper began a campaign to help the farmers and thereby help himself. He urged the county commissioners to open new roads and improve the old; he handled the farmers' surplus and paid for it in goods from the store—an exchange in which both profited. He showed the farmers that by using cream separators (sold by himself) they could market their cream, and wisely increase their herds of cattle in a region where pasture was going to waste. He procured the cooperative purchase of a stump puller, and clinched his argument for tractors by pointing out that they are not affected by annoying horse flies which are particularly vicious among the forests. He improved his stock of groceries and general merchandise, and at the same time made his patrons desire better things; he even sold ready-made dresses to the farmers' wives. He reached out also to another community, small but well able to pay, the campers who came to hunt and fish. He attracted them by his prompt and accurate information, and by providing guides and outfits. In short, unconsciously, but intelligently, he analyzed the geographic conditions, saw what kind of community they would ultimately produce, and acted accordingly.

Factors of Business Geography.—This example of business geography is so simple that its main relationships are obvious at once. It includes the following factors: (1) the *products* of a community, especially the lumber of the forest and the surplus milk and vegetables of the farmers; (2) the *needs* of the community, or the products that the people want or could be made to want; (3) the conditions of *transportation* as determined by the roads of all kinds; and (4) the *character and culture* of the people; that is, their habits and mode of life, their tastes in goods or services, their honesty and ability, and their degree of progress. Every business problem involves these four factors. It may include hundreds of millions of people and billions of dollars; it may involve several governments; and its study may demand the work of experts for years. Yet its geographical relations can be understood if the facts are known and are interpreted in the light of the four great factors: products, needs, transportation, and human character.

CHAPTER II

THE WORLD'S GREAT PRODUCTS

Man's Dependence on Material Products.—The overwhelming majority of mankind get a living in one of the following ways: (1) by *primary production*, that is, by producing something new, as on farms, or by taking some product from nature, as in mines, forests, and fisheries; (2) by *secondary production, or manufacturing*, that is, by changing and combining various products so that they become less bulky, more useful, or more attractive; (3) by *trade and commerce*, that is, by acting as middlemen between producer and consumer; (4) by *transportation*. Even the small minority (5) whose daily work consists of personal service or deals with finances, ideas and conduct, and other abstract conditions, as in banking, education, religion, government, and science, are largely engaged in problems arising because other people are engaged in producing all sorts of materials. The business of getting a living is obviously concerned mainly with products. Hence in business geography we deal chiefly with the distribution of products as to kind, quality, and amount, and with the distribution of the human qualities and methods which guide man's use of those products. The differences in these respects from place to place are enormous. Belgium and Massachusetts, for example, are small in area, but provide a hundred varied products for every three or four supplied by equal areas in parts of Siberia, the Sahara, and the Amazon basin. A million people in central China or southern India produce scarcely a tenth as much as a million in Sweden or Illinois.

Great Classes of Products and Their Uses.—The primary products that enter into the business of life may be divided into two classes, foodstuffs and raw materials for manufacturing. How these compare in value and how they are divided into subgroups according to their nature and use is illustrated in the table on page 6:

Relative Importance of Food, Clothing, and Shelter.—The great preponderance of food is obvious. In the United States, from 20 to 40 per cent of the total expenditure is usually for food—more among

ESTIMATED ANNUAL VALUE OF NEW PRODUCTION IN ALL COUNTRIES AT AMERICAN PRICES

I. Human food (including narcotics and stimulants but deducting grain fed to animals)		$69,950,000,000
1. Cereals	$18,425,000,000	
2. Vegetables	14,000,000,000	
3. Meat and fish	12,200,000,000	
4. Milk and eggs	10,600,000,000	
5. Vegetable carbohydrates (sugar, oil)	4,380,000,000	
6. Narcotics and stimulants	3,870,000,000	
7. Fruits	3,750,000,000	
8. Legumes	2,650,000,000	
9. Salt	75,000,000	
II. Raw materials		23,610,000,000
10. For clothing	5,300,000,000	
11. For shelter and furniture	2,685,000,000	
12. For fuel and power	10,380,000,000	
13. For other purposes, chiefly manufacturing	5,245,000,000	
Grand total		93,560,000,000

the poor, less among the well-to-do.* In less advanced countries, like Egypt, the percentage rises to perhaps 75. If data for manufacturing, as well as for primary production were available, we should probably find that in the world as a whole the types of business connected with the production, manufacture, transportation and distribution of food occupy at least half of man's attention and perhaps more. The cereals, judging by their value, are deemed worthy of about a fourth of the effort put into the work of getting food. The foods derived from animals (Nos. 3 and 4 in the table), apparently demand even more work; ordinary vegetables are nearly as valuable as the cereals, for the consumption in China and Japan is enormous. The carbohydrates in the form of sugar and oils form a much less important group. Narcotics and stimulants like tobacco and wine, though less valuable than a single food product such as rice (8 billion dollars), or milk (8800 million) present huge totals, as do fruits and legumes, although the data for the last two are far from exact. Salt, the only important mineral used as human food, is insignificant in value.

Turning to raw materials, the cotton, wool, linen, silk, hides and other materials used for clothing are worth little more than a quarter as much as the cereals, and one-fourteenth as much as all the world's

* The U. S. Department of Labor estimates that in 1918 or 1919 among 12,000 families in 42 states the average income was $1455 distributed as follows:

Food	38.2%	Fuel and Light	5.2%
Clothing	16.6	Furniture and Furnishings	5.1
Rent	13.0	Miscellaneous	21.3

food. Yet in the United States the ordinary family spends 10 to 20 per cent of its income on clothing. This large expense is due partly to the fact that, in proportion to the cost of the raw materials, the amount of work expended in manufacturing clothing is greater than in manufacturing foodstuffs. The chief reason, however, is that Americans can afford the luxury of abundant clothing. In countries like China, most of the work must be devoted to obtaining food.

Among the materials for shelter, and incidentally for furniture, wood is the outstanding product, but iron and other metals enter into practically every building in advanced countries. Elsewhere, grass and straw form the roofs of millions of houses and huts. Other millions consist of stone and clay, while cement, sand and gravel enter largely into the work of construction. Unless people have traveled widely, they often fail to realize how many millions of houses are made largely of clay, not only in the form of burned bricks and tiles, as in western Europe, but of sun-dried mud, or adobe, as in Mexico, Algeria, Persia, northern India, and northern China. The materials used in constructing new means of shelter each year appear to be about half as valuable as those used for clothing, and are actually worth less than the fruits. Nevertheless, in the United States people often spend 25 per cent or more of their income for rent, and the average is about 13 per cent. Even though this includes payment for the use of land as well as buildings, it is extraordinarily high compared with the sums paid by most of the world's people. One reason is that we constantly tear down good houses and build something new, partly because standards of living are rising, and partly because the growth of population and industry demands that the land in many cases be put to new uses.

Relative Importance of Raw Materials for Fuel, Power, and Manufacturing.—In supplying himself with food, clothing and shelter, which probably require at least 80 or 90 per cent of human activities, one of man's greatest aids is heat and power. Chief among the sources of heat and power are wood, and the mineral fuels, coal, petroleum, and natural gas. Wind and water likewise serve as sources of power, as do horses and other draft and pack animals. The greatest of all uses of power is for transportation. Next comes manufacturing, but cooking consumes a great deal, and so do heating, lighting, and the treatment of metals.

The last item in the preceding table is rather nondescript; it includes all raw materials not assigned to some other group. In one sense almost everything that man uses is at least slightly manufactured. Wheat is threshed, clay pressed into bricks, wood sawed, and coal

broken into usable sizes before being removed any great distance from the point of origin. Cooking is the most universal kind of manufacturing. In a more restricted sense, manufacturing commonly means the changes to which a raw material is subjected before reaching the ultimate consumer. In this sense food usually undergoes only the simplest manufacturing. It comes to the ultimate consumer wholly unmanufactured, like potatoes, or only slightly manufactured, like flour. Materials for shelter generally require more manufacturing than food products, but the original raw materials are usually altered only a little. With clothing, a more expensive type of manufacturing is needed, but the type in which the greatest values are added by manufacturing is the construction of complex objects of art, ornament, and convenience, and especially of tools and machines. These consist to a large extent of mineral products, especially the metals. In fact the chief item under the last heading in the preceding table is the various metals used in tools, utensils, and machinery. The metals differ from all other raw materials in having to be won from their ores by smelting and other metallurgical processes which require large amounts of fuel and power. They also differ in lending themselves to the manufacture of articles so complex and delicate that the original cost of the raw materials is insignificant compared with the cost added by manufacturing. Thus, although the raw materials used for these many manufacturing processes cost only about half as much as the world's milk and eggs, the value of the final manufactured products ranks much higher.

The World's Great Products.—Let us next see what the world's chief products are, and how they compare in value. Table A shows the approximate value of the new material of various kinds produced each year. It does not show the *total* value of any given product, but only the value of the **new** material produced in a single year. Thus, in 1924 the world's gold coin and bullion was worth something like 10 billion dollars, and the silver nearly 2500 million. Adding to this the 1400 million dollars' worth of gold and the 400 million dollars' worth of silver known to have been used in the arts and industries since 1880, and making some allowance for heirlooms, spoons and the like, the gold in the world is now worth at least 12 billion dollars and the silver, 3 billion. But the annual production since 1920 has averaged only about 370 million for gold and 240 million for silver. In the same way, when reckoned at American prices, the 130 million or more horses, mules, and asses in the world are worth somewhere near 11 billion dollars, but the amount of new value added through the growth of young animals is scarcely one-fourteenth as much.

TABLE A—THE WORLD'S CHIEF PRODUCTS

Approximate New Production per Year

(See note on page 507)

A	B	D	D	E
			World Production	
	Unit	Approximate Price per Unit ‖	Amount, Millions ‖	Value, Millions
A. Plant Products				
1. Rice, cleaned *	Lb.	$0.045	182,500	$8,000
2. Garden vegetables †	.....	.....	.....	8,000
3. Potatoes	Bu., 60 lb.	1.34	5,250	7,000
4. Hay *	Ton, 2000 lb.	14.86	250	6,000
Forage *	Acre	27.00	85	
5. Wheat	Bu., 60 lb.	1.40	3,650	5,000
6. Wood †	1000 cu. ft.	.....	60,000	4,000
7. Cotton	Bale, 478 lb.	207.00	18,670	3,900
8. Corn	Bu., 56 lb.	0.85	4,000	3,400
9. Grapes *	Hectolitre of wine	12.00	2,000	3,200
	Ton, 2000 lb.	50.00	17	
10. Sugar	Short ton	142.00	21	3,000
11. Millet †	Bu., 56 lb.	0.78	3,700	2,900
12. Beans †	Bu., 60 lb.	3.34	650	2,200
13. Oats	Bu., 32 lb.	0.49	3,910	1,900
14. Rye	Bu., 56 lb.	1.00	1,330	1,300
15. Orchard fruits (except apples) †	Bu., 48 lb.	.....	.....	1,000
16. Barley	Bu., 48 lb.	0.72	1,360	1,000
17. Sweet potatoes and yams †	Bu., 55 lb.	1.05	800	800
18. Apples *	Bu., 48 lb.	1.20	600	700
19. Tobacco *	Lb.	0.21	3,300	700
20. Bananas †	Bunch (100–150)	0.45	1,200	550
21. Peas, ordinary †	Bu.	3.20	165	450
Cowpeas †	Bu.	2.00		
22. Tea †	Lb.	0.30	1,500	450
23. Olives *	Gal. of oil	0.20	1,700	§400
24. Berries †	.....	.....	.....	400
25. Cottonseed	Short ton	40.00	10	400
26. Peanuts, shelled *	Lb.	0.06	6,000	350
27. Coffee	Lb.	0.12	2,700	320
28. Citrus fruits *	Box, 78 lb.	2.10	140	300
29. Flaxseed	Bu.	2.52	110	280
30. Cocoanuts and palm oil †	Nut	0.025	7,000	250
	Lb. of oil	0.07	100	
31. Flax fiber	Lb.	0.26	750	200
32. Rubber	Lb.	0.23	620	150
Total	.....	.....	.....	$68,500
Human food	.....	.....	.....	43,405
Animal food (see p. 15)	.....	.....	.....	12,695
Raw materials (wood, cotton fiber, flaxseed, flax, rubber)	.....	.....	.....	8,530
Narcotics and stimulants (tobacco, tea, coffee, plus $2,400,000,000 for wine)	.....	.....	.....	3,870

* Rough estimate. † Very rough estimate. ‡ Data insufficient for reliable estimate.

§ Includes allowances for pickled olives.

‖ Based on price at point of production or importation in U. S.

TABLE A—THE WORLD'S CHIEF PRODUCTS—*Continued*

A	B	C	D	E
			World Production	
	Unit	Approximate Price per Unit	Amount, Millions	Value, Millions
B. *Animal Products*				
33. Milk *	Gal.	0.22	40,000	8,800
34. Cattle *	Head	39.00	150	6,000
35. Swine *	Head	12.70	300	3,800
36. Sheep *	Head	7.40	220	2,000
Goats *	Head	5.00	55	
37. Eggs †	Dozen	0.31	6,000	1,800
38. Poultry †	Head	0.85	1,500	1,300
39. Fish †	Lb.	0.03	.....	1,000
40. Wool *	Lb.	0.322	2,900	900
41. Horses *	Head	91.00	7.3	800
Mules *	Head	145.00	0.9	
Asses *	Head	11.50	1.1	
42. Hides †	Lb.	.....	450	700
43. Raw silk *	Lb.	7.25	67	500
Total (except hides, which are included in data for specific animals)	.....	.....	.....	$26,900
Total food (items 33–39, minus value of hides and $\frac{1}{5}$ of cattle)	.....	.....	.....	22,800
Total raw materials	.....	.....	.....	2,100
Total sources of power (horses and $\frac{1}{5}$ of cattle)	.....	.....	.....	2,000
C. *Mineral Products*				
44. Water (for drinking, etc.). Water power	Insufficient data			
45. Coal, bituminous	Ton, 2000 lb.	3.06	1,300	4,400
Anthracite	Ton, 2240 lb.	5.41	80	
46. Petroleum	Barrel, 42 gal.	1.85	1,000	1,850
47. Pig Iron	Ton, 2240 lb.	26.10	70	1,800
48. Cement †	Barrel, 376 lb.	1.86	.....	500
49. Stone †	Ton, 2000 lb.	1.58	300	470
50. Copper	Lb.	0.161	2,700	430
51. Gold	Troy ounce	20.67	17	370
52. Natural gas §	1,000 cu. ft. (gas)	0.26	800	280
	Gal. (gasoline)	0.14	500	
53. Silver	Troy ounce	1.00	240	240
54. Tin	Lb.	0.60	280	170
55. Lead	Lb.	0.062	2,700	165
56. Sand and gravel †	Ton, 2000 lb.	0.70	200	140
57. Zinc	Lb.	0.07	2,000	140
58. Salt *	Ton, 2000 lb.	4.20	25	100
Total	.....	.....	.....	$11,055
Total fuels	.....	.....	.....	6,530
Total metals	.....	.....	.....	3,315
Total other	.....	.....	.....	1,210

* Rough estimate. † Very rough estimate. § Including gasoline made from natural gas.

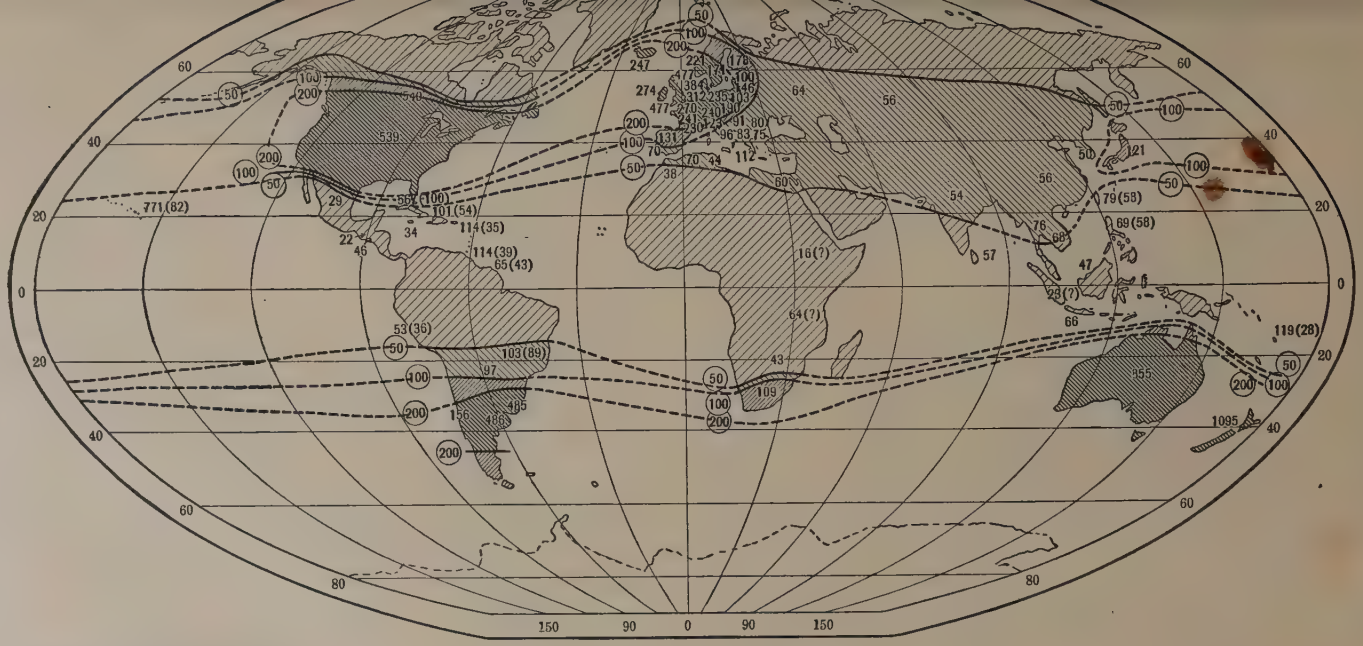
Explanation of Table of World's Chief Products.—In Col. A of this table the products are arranged according to the value of their annual production, the vegetable, animal, and mineral products being placed separately. Column B shows the unit ordinarily used in measuring the various articles. Then comes the average price at the farm, mine, smelter, quarry, wharf, or other point of production in the United States, or else the wholesale or import price in Chicago or New York. The prices of articles not produced in the United States represent the cost under conditions of oriental or tropical labor, plus the cost of transportation, commissions, and so forth on the way to New York. They may be lower than would be the case if the product were raised in the United States.

Column D, the estimated production for the whole world, shows in round numbers how many *millions* of each unit have probably been produced per year since 1921. The data vary greatly in accuracy, as appears from the number of asterisks in Col. A. Approximately exact statistics for all countries are available only for the fuels and metals, but the missing data for wheat, potatoes, corn, sugar, oats, rye, barley, tobacco, cotton, flax, coffee, tea, and rubber have been estimated with considerable accuracy by the International Institute of Agriculture and the United States Department of Agriculture. For other products, such as rice, grapes, apples, and most of the animals, there are good statistics for many countries, but only rough estimates for some important countries, such as China. In still other instances, such as hay, wood, and garden vegetables, the data are still more scanty. Even in countries like the United States, some hay, and huge quantities of vegetables, are raised on small tracts which do not form parts of farms, and hence are not recorded by the census. These can be estimated only roughly, but an allowance for them has been added to the more accurate statistics from the farms. In countries like Russia, China, India, or even Japan, the whole of such crops must be estimated. Finally, for one product, bananas, practically no reliable data are available. In Column E the value of the yearly production for the whole world has been roughly calculated by multiplying the United States price by the annual production. The results are given in round numbers, partly because we are here dealing merely with approximate estimates, and partly because the production and price both vary from year to year. In spite of all the difficulties, the table gives a good idea of the approximate value and relative importance of the world's chief products. The places where each product is produced and the amounts produced in each place are given in the Appendix and in the maps scattered through this book.

Contrasts in Productivity from Place to Place.—Our task in business geography is to interpret the distribution of products as summed up in Table A, and as shown in detail in the tables at the end of the book. We must find out how far the amount of production depends upon physical conditions such as relief, soil, climate, natural facilities for transportation, and the nature of the minerals, plants, and animals found in a region. We must likewise discover how far production depends upon man's energy and ability as determined by his racial inheritance and health; and how far upon his stage of culture and the density of population. It is equally necessary to ascertain in what proportions different kinds of products enter into the production of any region. Then we must see how primary production is related to manufacturing, and how both are related to commerce. Above all, we must endeavor to determine how far the facts that we observe are bound together by definite principles. Even a most cursory study is enough to show how greatly not only the total productivity but the productivity per person varies from country to country.

In New Zealand the average farmer produces goods which are worth 18 times as much as those produced by the average man engaged in similar work in Java. In the north-central and western United States the production is nearly as great as in New Zealand, whereas in places like Borneo, Central Africa, and the Amazon forests, where white men have not yet settled, the average production per family is probably not half as great as in Java.

Geographical Distribution of Productivity.—For the world as a whole, the general degree of productivity per family among farmers, lumbermen, and fishermen is illustrated in Fig. 2. Although this map represents mainly farmers, it also gives a fairly good general idea of the distribution of productivity among other primary producers and among workers in factories. In fact, it probably goes about as far as is now possible in giving a representation of the geographical distribution of man's productivity. Certain prominent features stand out at once. One is the fact that by far the greatest production per person is found in certain new countries, especially the northern and western United States, Canada, Australia, New Zealand, and Argentina. But note that other new regions Brazil, Chile, Peru, Mexico, and Ecuador show very low productivity. Again, the productivity in Europe as a whole is high, but varies greatly from a maximum around the North Sea to a minimum in Portugal, Bulgaria, and Russia. All parts of Asia except Japan stand low, and the same is true of Africa, aside from the far south. All the tropical parts of America likewise stand low, and so do all regions in high latitudes.



Denoyer's Semi-elliptical Projection.

FIG. 2.—World Map of Productivity per Capita.

This gives a rough approximation to the productivity per capita of the agricultural, fishing and lumbering population in dollars when all commodities are reckoned at American prices.

Numbers in parentheses indicate productivity of tropical regions when sugar (and in Brazil, coffee) are omitted. Lightest shading indicates areas where the annual production, when reckoned at American prices, probably falls below $50 per capita, providing there is no special stimulus due to the presence of people from bitter climates.

To get the income per family the figures here given should be multiplied by 5, then various deductions must be made to cover expenses such as fertilizer, labor, equipment and depreciation. These form a negligible percentage where the incomes are small, but rise considerably in places like the United States, Argentina, and Australia. Remember that this map is only a rough approximation to the truth, for exact statistics are lacking in many places. Nevertheless it sums up the main facts of Business Geography better than does anything else yet available.

EXERCISES AND PROBLEMS

1. From Table A select the ten most important food products, including both plants and animals. Give reasons for your selection. From Tables 11, 13 or 22 * in the Appendix, prepare for each product a list showing the production in every country that produces more than one per cent of the world total as given in Table A. Arrange each list in the order of the importance of the countries as producers. On an outline map of the world, insert in each country the names of all products under which that country appears in your lists. Make a general statement as to the following points:

(*a*) The countries that are most important as producers of food products.

(*b*) The relative degree to which the different products are concentrated in a few countries or distributed among many.

(*c*) Your tentative conclusions as to reasons for the conditions of distribution which you notice. The main purpose of this book is to amplify and correct such conclusions.

2. Repeat Exercise 1, but use raw materials instead of food products. (See Tables 11, 13, 23, 26.) Do not include cement, stone, or natural gas, since data for their production are not available.

3. From Tables 15, 17, 22, 24, and 27, see how your state stands in the production of the 20 products used in Exercises 1 and 2. Give tentative reasons why it ranks high or low in these products, and as a producer in general. As a help in doing this, make a list of the four countries that are the largest producers of each product. Compare the advantages of the countries that stand highest in each product with those of your own state.

4. How far does the distribution of human productivity in Fig. 2 agree with that of temperature? What differences in the distribution of these two types of phenomena do you note (*A*) in the temperate zones, (*B*) in the torrid zone? Interpret the numbers in parentheses within the tropics, and draw inferences as to the factors which lead to high productivity in temperate and tropical regions, respectively. Frame tentative conclusions as to the relative importance of the climatic and human factors in determining the distribution of productivity, but remember that later studies may modify these conclusions.

* Hereafter, where tables are referred to by *number*, it will be understood that they are in the Appendix.

CHAPTER III

CLIMATIC LIMITS AND OPTIMA

Dependence of Chief Products on Climate, Relief, and Soil.—An utstanding feature of the world's chief products is the relative impor-nce of plants compared with animals and minerals. Out of 58 prod-ts, in Table A, 32 are derived from plants, whereas the animal oducts number only 11, and the minerals 15. A more important mparison is based on values.* When proper allowance is made for e items that appear twice, and for food fed to animals, the annual oduction of the world's chief products, aside from manufactures, ay be classified as follows:

Vegetable products	$68,500,000,000
Animal products (deducting animal feed)	14,005,000,000
Mineral products	11,055,000,000
Total	$93,560,000,000

In other words, plants furnish about 73 per cent of the value of all e world's chief products, and animals another 15 per cent. Thus e distribution of about 88 per cent of all primary production is closely pendent upon climate, relief, and soil. Man himself, to be sure, is e main factor in determining the abundance of a cultivated plant or omestic animal in a given area, but long experience has taught him to

* In order to estimate these values truly, we must deduct all values that are cluded twice. For example, hay and forage are mainly consumed for the purpose raising animal food or of replacing old animals and thus are really included under ner items. Only the part fed to work animals is not included again, for it is not nverted into meat, milk, and the like, but into power. The value of hides, but not wool, is also included in the value of the animals. We may roughly assume that e following percentages of the *values* of various articles are fed to animals either as vhole or in the form of residue such as the bran of wheat: hay and forage 100 r cent; corn, 80; oats, 70; barley, 50; potatoes, 20; rye, 10; and wheat, vegetables llet, and cottonseed, 5 per cent. Of course, other products, such as skimmed milk, e fed to animals, but we may roughly balance these against the materials fed to rk animals. Some allowance ought also to be made for the low prices of products t raised in the United States, but it is so difficult to do this accurately that we ıll not attempt it.

cooperate with Nature rather than oppose her. No matter how skillful he may be in creating artificial climates, topography, and soils, it generally pays to raise both plants and animals in regions as well adapted to them as possible.

In a general way, climate determines the broad world-features of the distribution of every plant and animal. Arctic regions, temperate rainy regions, deserts, and moist tropical regions are climatic types familiar to almost everyone. Relief, on the whole, determines smaller features of distribution than does climate. The vegetation and animal life of a steep slope differ from those of an adjacent level plain. Nevertheless, if oceanic hollows as well as uplifted mountains be counted as features of relief, as they legitimately may, the relief of the earth's surface may be as effective as climate in barring one species or another from vast areas. The chief effect of the soil upon the geographic distribution of plants and animals is much more local than that of either climate or relief. Different parts of the same level garden may give quite different yields of the same crop, or may be fitted for wholly different crops because one part is sandy and another loamy. On the other hand, where the evolution of the soil has depended on special conditions of climate, relief, and vegetation, the soil may be a main factor in causing broad areas to differ radically from one another.

Dependence of Distribution of Products on Man.—After climate, relief, and soil have done their part in determining the distribution of plants and animals, man makes further alterations. To a certain extent he actually creates new conditions of climate, as in hot beds; new relief, as upon terraces; and especially new soils through plowing, drainage, irrigation, and fertilizers. His greatest influence upon the distribution of both plants and animals, however, consists either in exterminating the kinds that he does not want—for example, wolves in settled regions and grass in corn fields—or else in carrying living species across barriers of climate, relief, or soil that they could not naturally surmount. Thus wheat, oats, Scotch thistles, cattle, horses, house-rats, starlings, and the germs of scarlet fever are a few of the many species that have been imported into America from the Old World. Potatoes, corn, tobacco, the grape-attacking species of phylloxera, and the germs of yellow fever have been transported the other way. As soon as a species is brought to a new region, its further distribution again becomes subject to the climate, relief, and soil. These factors, it should be noted, often exert their influence indirectly as well as directly. A species introduced into a new environment may die out, not because the climate and soil are unfavorable, but simply because they are still more favorable to other species, so that the

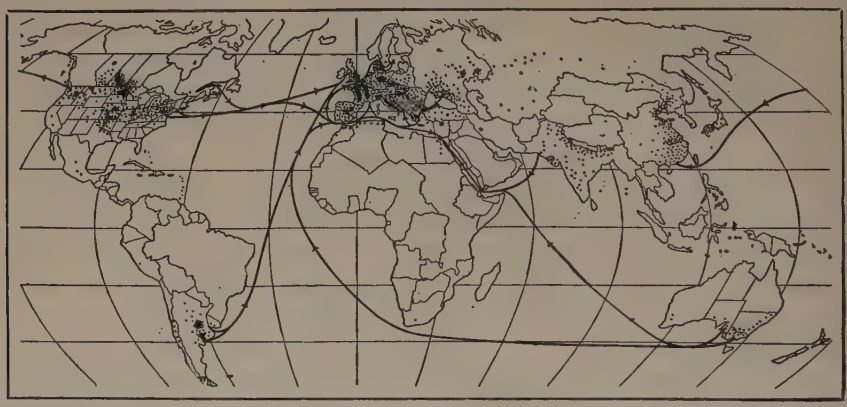
others exterminate the new one. In fact, a large share of the effect of purely physical conditions upon the distribution of plants and animals, and also upon human activities, is produced indirectly through other species. Thus, although man keeps trying to introduce sheep into southern Japan, they are almost excluded by nature, partly because the very humid, hot summers are directly unfavorable, but probably even more because the climate fosters not only a coarse kind of herbage on which sheep do not thrive, but also a fatal parasitic disease known as foot-rot.

Limits versus Optima.—The dependence of production on climate is illustrated by the well-known fact that in certain areas a given species of plant or animal will not thrive or perhaps cannot be raised at all, while elsewhere the same species thrives wonderfully Corn, for example, does not ripen in the cool, moist summers of Scotland but grows splendidly in the warm, sunny, showery summers of Iowa. Wheat cannot be raised under natural conditions in the Congo region; it yields an average of only about 5 bushels per acre in Tunis; in France it yields 21 per acre; but in Lapland, again, it will not grow. Neither will wheat thrive in pure sand or in the salty soils of many desert regions. European cattle soon suffer in health in regions where they are obliged to browse only on bushes or coarse, reedy grasses such as are native to places with long, hot, rainy summers and no cold season. At Hongkong, for example, such conditions, combined with insect pests, parasitic diseases, and the damp, steady heat, make it almost impossible to breed European cattle. The two-humped Bactrian camel is extraordinarily well adapted to the dry desert, and can stand the most intense cold, provided both air and earth are dry. In snow or mud, however, the great brute sometimes slips until it falls on its stomach with its legs stretched out in front and behind, thus straining a tendon so that it has to be killed. This is especially likely to happen in rugged regions where the trails are steep. Again, when the nomads of Central Asia graze their camels among the moist mountains, they often protect them from the drizzling rain with woolen blankets, though the temperature is far above freezing. Otherwise these drought-loving animals might be chilled and die, even in summer.

These examples bring out the fact that two main conditions must be considered in order to understand the distribution of plants and animals. One is the *limits* outside of which it is impossible for a species to thrive; the other is the conditions under which a given species thrives best, that is, the *optimum*. In the approximate order of their relative importance, the main factors, aside from man himself, in determining the limits and optima of various species, are (1) climate,

(2) relief, (3) soil, (4) food, (5) disease. All of these are included in the examples given above. In this chapter we shall devote ourselves mainly to climatic limits and optima, but these are so closely connected with food and disease that the three can scarcely be separated.

The Climatic Limits of Wheat.—Wheat offers a good example of how production is limited. The temperature limit is sometimes said to be an average of 50° F. for at least four months; and sometimes an average of 57° during the summer. These two statements are essentially the same. They indicate that unless the summer temperature remains above a certain level for a certain length of time, wheat cannot ripen. Thus the temperature during the growing season provides for wheat a definite limit of latitude and altitude.

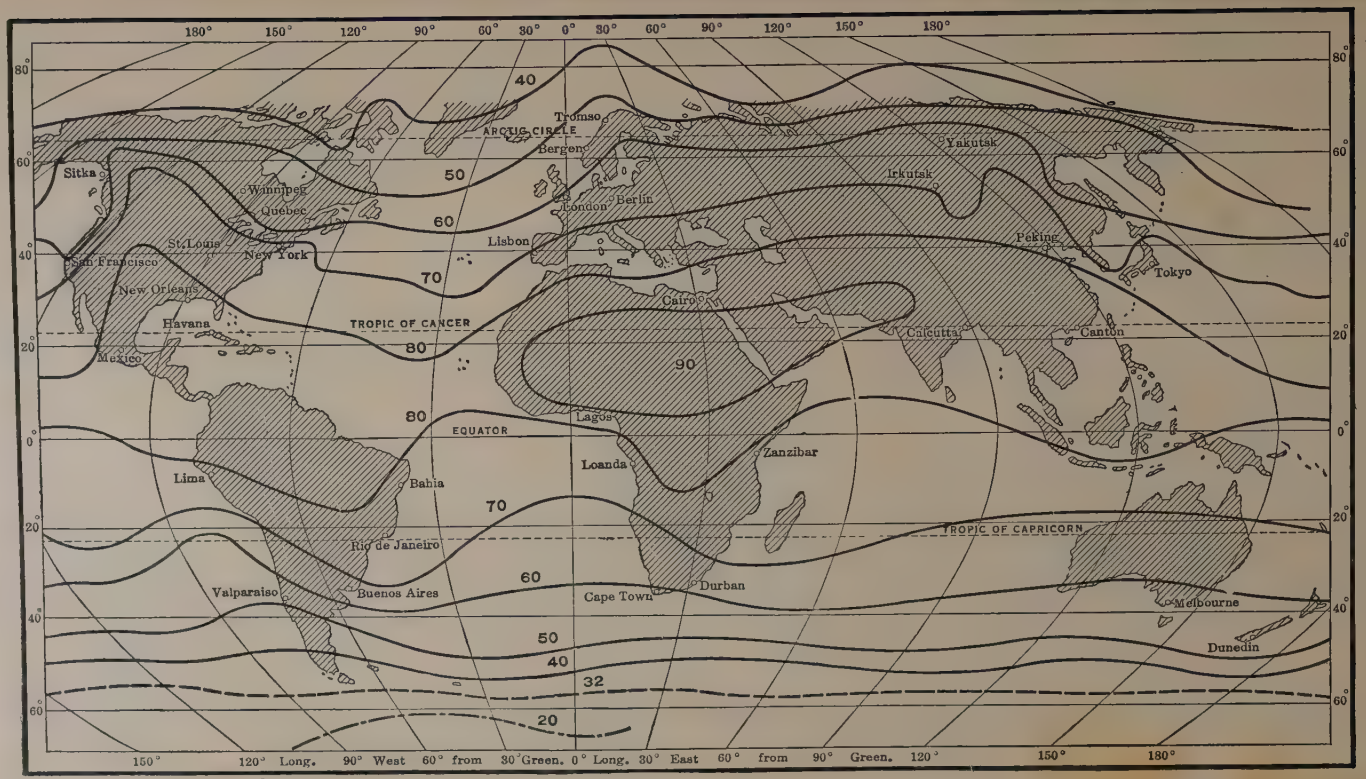


Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 3.—World Map of Wheat.
Each dot represents 5,000,000 bushels.

The preceding statement is based on what may be called the botanical method of determining the limits of wheat culture. For our purposes it is profitable to follow also a geographical method, which obliges us to compare maps of products with those of climate. A comparison of the world-map of wheat, Fig. 3, with that of temperature in July, Fig. 4, shows that no wheat grows north of the July isotherm of 60° F., and very little north of where the 65° isotherm would run if inserted on the map. A similar comparison with the January map of temperature, Fig. 5, indicates that in the southern hemisphere the same midsummer isotherms form the polar limit of wheat. Evidently, wheat is not raised in appreciable amounts unless the warmest month has a temperature of at least 60° F., and preferably 65°.

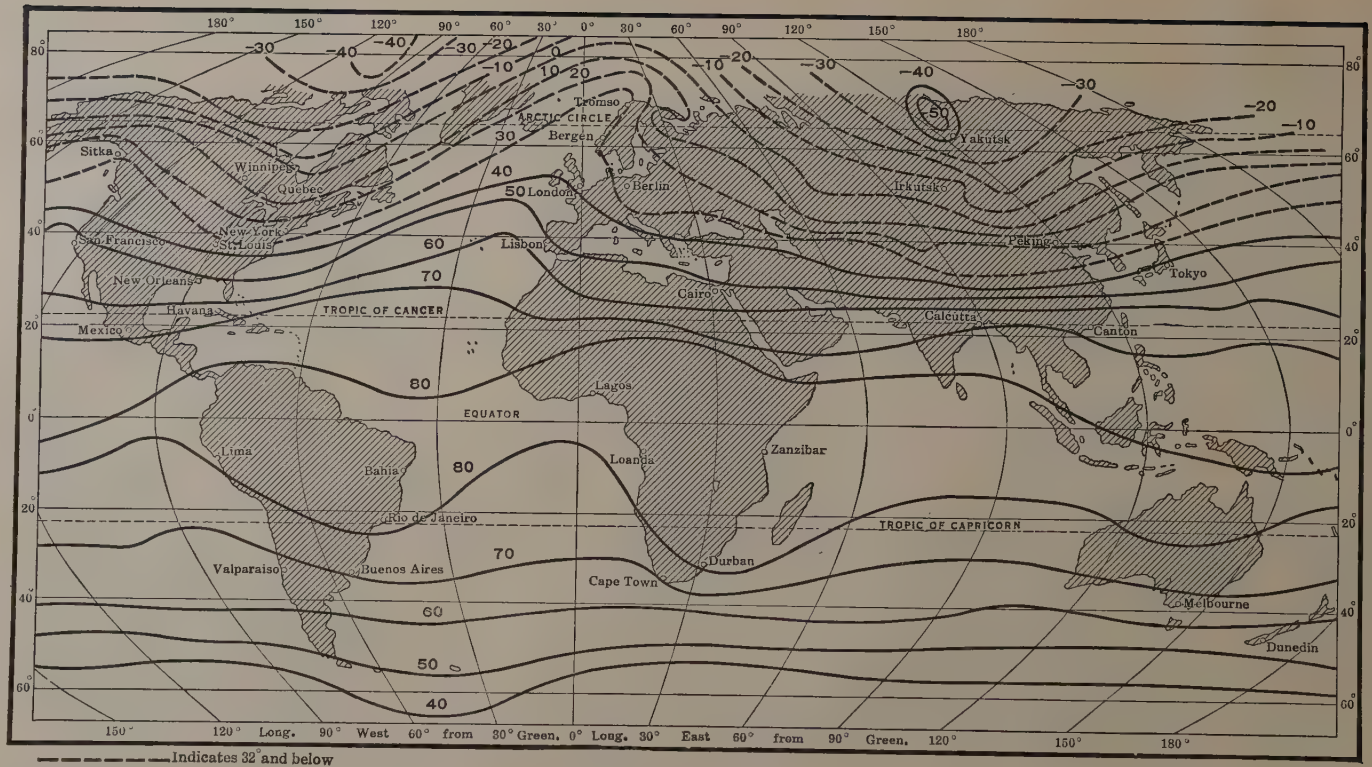
The upper limit of temperature for wheat is probably not reached in



——— Indicates 32° and below

Denoyer's Semi-elliptical Projection.

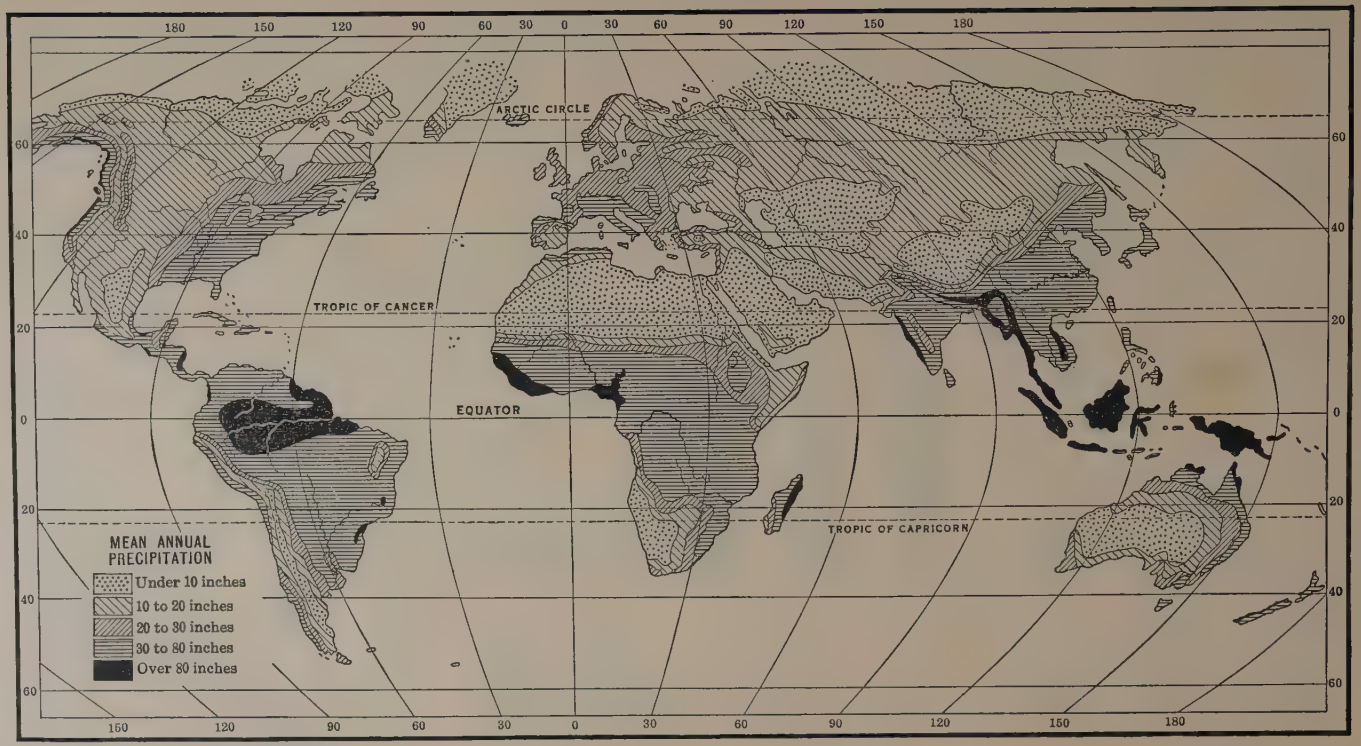
FIG. 4.—World Map of Temperature in July.



——— Indicates 32° and below

Denoyer's Semi-elliptical Projection.

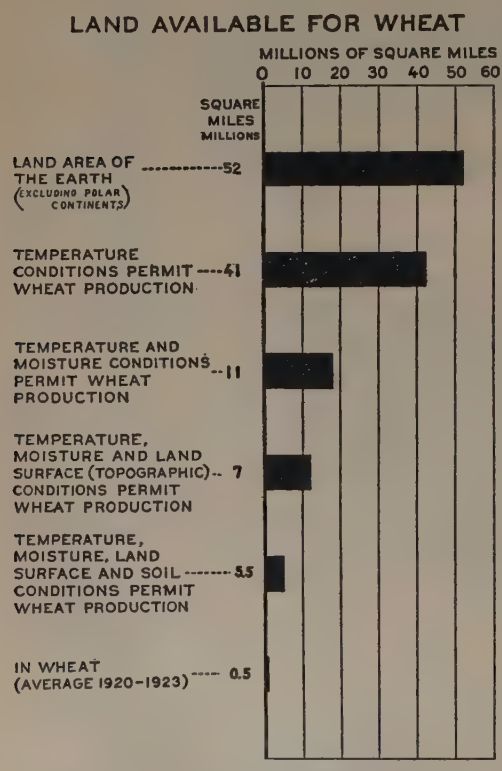
FIG. 5.—World Map of Temperature in January.



Denoyer's Semi-elliptical Projection.

FIG. 6.—World Map of Distribution of Rainfall.

any part of the earth. Nevertheless, wheat growing is almost unknown where the coolest month has a temperature above 60° F. Only on high plateaus is wheat shown in low latitudes in Fig. 3, but such places are relatively cool. The isotherms of Figs. 4 and 5, as of all maps of this kind on a small scale, indicate the temperature as it would be at sea level, and not as it actually is at high levels. If the coolest month in any region has a temperature above 60° F., the climate is generally better adapted to other crops, such as rice, rather than wheat. Moreover, in such warm places, if the amount of rain is sufficient to foster rapid growth, the seed is likely to rot and the growing wheat to be injured by rusts, smuts, and insects.


LAND AVAILABLE FOR WHEAT
MILLIONS OF SQUARE MILES
0 10 20 30 40 50 60
SQUARE MILES MILLIONS
LAND AREA OF THE EARTH (EXCLUDING POLAR CONTINENTS) 52
TEMPERATURE CONDITIONS PERMIT WHEAT PRODUCTION 41
TEMPERATURE AND MOISTURE CONDITIONS PERMIT WHEAT PRODUCTION 11
TEMPERATURE, MOISTURE AND LAND SURFACE (TOPOGRAPHIC) CONDITIONS PERMIT WHEAT PRODUCTION 7
TEMPERATURE, MOISTURE, LAND SURFACE AND SOIL CONDITIONS PERMIT WHEAT PRODUCTION 3.5
IN WHEAT (AVERAGE 1920-1923) 0.5

Courtesy of O. E. Baker and Economic Geography.

FIG. 7.—Limitations of Wheat Culture.

This brings us to the question of rainfall. A comparison of Figs. 3 and 6 shows that practically no wheat grows where the annual rainfall is less than 10 inches except in a few irrigated areas like Egypt. Large sections of the southwestern United States, northern Mexico, North Africa, Arabia, South Africa, and Australia are practically without wheat because they are so dry. On the other hand, no matter how favorable the temperature may be, wheat is not raised in appreciable amounts where the annual rainfall is much above 45 inches, as in the southeastern parts of the United States and Asia. The distribution of wheat appears to be limited by rainfall more than by temperature.

Baker's Estimates of Wheat Areas.—The whole matter has been summed up by Dr. O. E. Baker in Fig. 7. The upper bar represents the 52 million square miles which form the total area of the lands of the

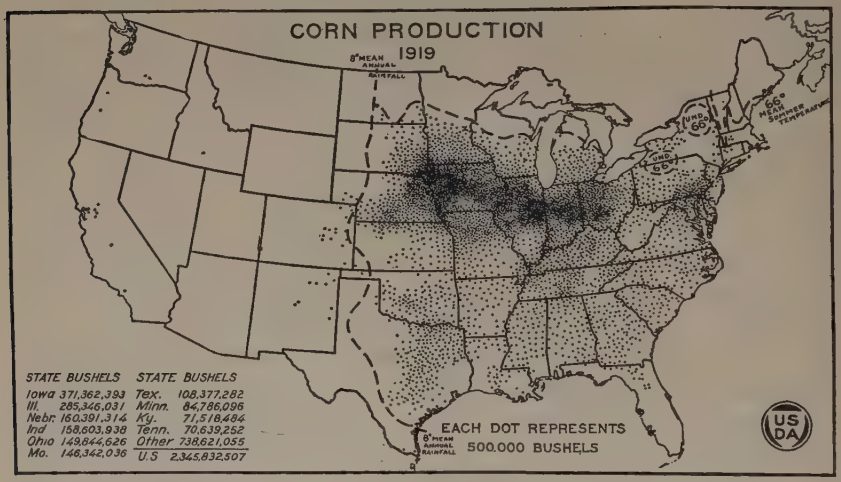
earth aside from polar regions. The next bar indicates that low temperature in high latitudes and on plateaus reduces the area where wheat can be grown to 41 million square miles. But about 17 million square miles that are warm enough for wheat are too dry, while another 13 million are too wet. That leaves only 11 million that are warm enough and neither too dry nor too wet, as appears in the third bar.

Non-climatic conditions also limit the areas where wheat or any other crop can be grown. The fourth bar of Fig. 7 indicates that the 11 million square miles where the climate permits wheat to grow contain 4 million so rugged that cultivation is impracticable, thus reducing the available area to 7 million. But even though the temperature, precipitation, and relief are favorable, the soil may not be. Poor soils prevent the growth of wheat in another $1\frac{1}{2}$ million square miles otherwise fit. Thus, for one reason or another, only about $5\frac{1}{2}$ million square miles, or one-tenth of all the non-polar lands of the earth, are fit for wheat. The last little line of Fig. 7 shows that only a tenth of this tenth is actually used.

Similar limitations, both physical and human, apply to all crops. Among the physical limitations those imposed by climate are generally the most important. In the present case they eliminate 80 per cent of the lands, whereas relief and soil eliminate about 50 per cent of the area for which their limiting effect has been calculated. The limitations imposed by man are often greater than those imposed by nature. In the case of wheat, the two types of limitation are about equal, for natural limitations throw out nine-tenths of the lands of the earth, and human limitations nine-tenths of what is left. The human limitations restrict wheat much less than other less useful crops. Barley, for instance, is less limited by nature than is wheat, but in the United States it occupies only 12 per cent as much land.

The Nature of Climatic Optima: Corn.—The conditions under which a product makes the best growth are quite as important as the limits beyond which it will not grow. The most favorable conditions of temperature, humidity, variability, and sunshine constitute the climatic optimum. In the case of corn, for example, the area of greatest production in the United States, Fig. 8, has an average summer temperature of about 75°, which is not far below the optimum temperature of greatest growth. Corn not only needs a high summer temperature, but requires about 140 days without frost. Such conditions are found where the temperature of the germinating and ripening seasons averages approximately 55° or 60°. The optimum rainfall varies according to such factors as the duration of sunshine, and the capacity of the soil to retain moisture, but it may be defined as an amount sufficient to

keep the ground moist, though not water-logged, during the period of rapid growth. At a later period, when the full-grown ears are ripening, the amount of rain should diminish somewhat. The average monthly rainfall in the Corn Belt of the central United States during the critical period when the ears are developing, usually July, is about 4 inches. A moderate increase raises the production, but a great increase does not produce a corresponding effect. On the other hand, even a slight decrease below 4 inches diminishes the corn crop. Thus the optimum July rainfall appears to be more than 4 inches but less than 8.



Courtesy of U. S. Department of Agriculture.

FIG. 8.—Corn Production in the United States.

This abundant rainfall must not be accompanied by great cloudiness, for that stunts and rots the corn. Hence the optimum is warm, sunny weather, interspersed with frequent showers. A close approach to the optimum causes eastern Nebraska, Iowa, Illinois, and Indiana to be the great corn region of the world. The optimum for the growth of corn after it is well started is approached still more closely in certain tropical regions. Unfortunately, although the seed germinates rapidly in those regions, it is apt to decay or be eaten by insects. This is true not only when the seed is planted but when it ripens, for insects and blights attack it very quickly. In addition to this, harmful bacteria in the soil, the rapid growth of weeds, and careless methods of cultivation tend to make the yield per acre lower in tropical regions than in those with cooler climates. Table 12 (Section II) in the Appendix

shows an average production of only 12 or 13 bushels in the Philippines and Java compared with about 27 in the United States and Argentina.

The character of the soil, the relief of the land, and the skill of the farmer greatly influence the corn crop, but are not the main factors. This appears from the fact that although Manitoba and eastern Colorado rival the corn states in soil, in levelness, and in the skill of the farmers, they produce little corn. Manitoba is too cool, Colorado too dry. South of the isotherm of 66° F. as the average for June, July, and August (Fig. 8), the climate is sufficiently warm for corn to flourish. East of the isohyet indicating a total rainfall of 8 inches for June, July, and August, there is moisture enough. North and west of these limits, because of low temperature and light rainfall, corn grows only in very small quantities. The climatic optimum for corn joins with other things in helping to explain why an average acre of farm land in Illinois, according to the 1920 Census, is worth $164, whereas an acre in North Dakota, where the climate is not fit for corn, is worth only $35. It also helps to explain why Iowa raises 45 hogs per farm and Wyoming only 13; why corn cakes are a great bread-food of Mexico, and why Rumania is the chief corn country of Europe.

In the same way the optimum for rice is a temperature which averages near 80° F. for at least three months, and which has abundant sunshine and a great abundance of water. The water may be supplied either by frequent rains or by perennial streams or reservoirs, but in either case the optimum conditions demand that the water be led to the rice fields by irrigation and be kept gently moving over them for at least a month or two. In parts of Java, Siam, and southern India these conditions prevail practically all the time; and nearly three crops of rice can be raised per year. In China, Japan, and Chosen they prevail for some months, so that two crops can be raised in South China and one fine crop even in northern Japan. The Guianas and neighboring parts of Brazil and Venezuela are as favorable as Java, while Louisiana and Texas, with their level plains and heavy summer rainfall, rival Japan. As far north as the central valley of California and even in the Po Valley of Italy, the summer temperature is high enough and the season long enough for rice. The rainfall is scanty, however, and irrigation is expensive, so that the amounts actually raised are small.

The Climatic Limits of Animals: Cattle.—Animals appear to be almost as closely limited by climate as are plants. The thick-haired yak of the cold, snowy Himalayas cannot live when brought to low altitudes. Even the pleasant summers of the Vale of Kashmir, some 5000 feet above the sea, are fatal to it. Other members of the cattle family are limited by other climatic conditions. The water buffalo of

southern Asia suffers in cold weather not only because of its lack of hair, but because it cannot bathe. Its approximate poleward limit is a temperature low enough to freeze its bathing places.

Animals are subject to climatic limits of at least three kinds: (1) limits imposed indirectly by the scarcity or poor quality of the food, as in very snowy regions, deserts, dense forests, and tropical countries where the vegetation is rank and coarse; (2) indirect limits imposed by disease or insects, as in the case of the tsetse fly which prevents not only cattle but horses, sheep, and some other animals from living in large parts of central Africa; (3) direct limits imposed by the fact that the climate itself so weakens the animals that they fall a prey to disease, or cannot produce healthy young, as in the case of yaks in Kashmir.

The Optimum for Horses.—The climatic optima of animals are not so evident and have not been studied so carefully as those of plants, but they are just as real and important. We have already seen how the camel usually loses its value when taken into a climate where rain or snow is common. In the same way, the horse does not thrive everywhere. When a horse is brought from southern Texas to Cleveland, for example, he is often somewhat sickly at first and has to be acclimated. But neither southern Texas nor Cleveland has the kind of climate most favorable to horses. In the wild state the horse thrives best in a climate too dry for forests, but moist enough for abundant grass. In winter the snow must not be so deep that the horse cannot paw through it to the grass. The domestic horse can thrive in many regions that are naturally forested and snowy, provided man sees that the animal has plenty of good food. This illustrates the highly important fact that for wild animals, and also for primitive man, the best climate is one that furnishes a proper food supply, as well as one that has a good effect directly upon health.

All things considered, the horse thrives best where the summer pasture and the winter hay are especially nutritious, and where the temperature and humidity are moderate both in summer and winter. Where great heat is coupled with humidity, the horse, unlike his relative the mule, suffers from something which seems similar to sunstroke in man. Again, the ordinary horse, unlike the shaggy Shetland pony and the Mongolian horse, cannot stand extreme cold and blizzards. Hence, in a good horse-raising region the temperature should not average much over 70° F. in the warmest month unless the air is dry, in which case an average of 80° or more is not prohibitive, as in Arabia. In winter, the temperature ought not to average much below 40° and there should not be severe storms, although other conditions such as

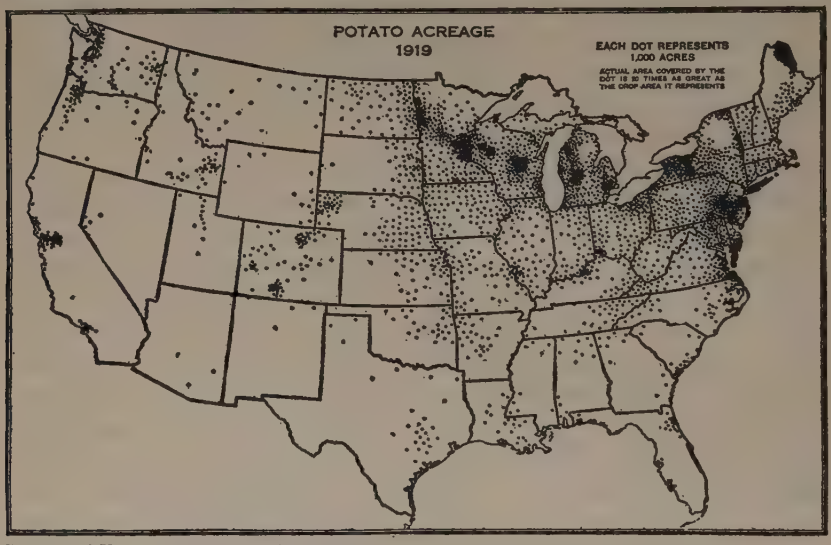
human activity and good farm land cause many horses to be raised in more severe climates, such as that of Iowa. The climates of England, northern France, and Kentucky are more rainy and cloudy than the optimum for wild horses. Nevertheless, when combined with the kinds of horse-feed that can there be raised cheaply, they help to make those regions among the best in the world for horses. That is one reason why the Percheron, the English racer, and the Kentucky thoroughbred are famous. In this case, as in many others, the location of the finest products depends partly on the climatic optima for both plants and animals, partly on the climatic optima for man, partly on soil and relief, and partly on such conditions as markets, which are less strictly geographic.

The Principle of Limits and Optima.—It would be interesting to examine the climatic limits and optima of all the world's useful plants and animals; but to do so in detail would require too much space and would involve repetition of the same kind of items that have already been set forth in respect to wheat, corn, rice, and horses. Moreover, the maps and tables of products in this book, when taken in conjunction with the climatic maps, give a good idea of the climatic limits and optima of practically all the chief products. In later chapters, where the distribution of products is discussed, we shall consider the matter more fully. We shall also discuss the climatic optima and other relationships of man, which are quite as important as those of plants and animals. Bear in mind that the limits as determined from the study of the maps do not represent the absolute limits within which a species can live, but merely the limits within which it is now *profitable* to raise it. In practically every case, man can much enlarge the range of a species by selecting the types best adapted to a given extreme of climate; by fertilizing the soil; by raising or importing types of food which do not naturally grow in a region; by protecting the plants or animals from bacterial infection and other sources of disease; by providing artificial protection against climatic extremes; and by exterminating other species which in a state of nature would drive out the one in question, just as grass tends to drive out corn. Bear in mind also that some crops, such as barley, are raised in largest quantities in regions which depart considerably from the climatic optima. This is because wheat and barley have nearly the same optima, but barley has wider limits. Since wheat is the more valuable crop it displaces barley in the best climates. The great principle on which to focus attention is that every plant and animal thrives best under certain definite climatic conditions, and will not thrive at all where the climate goes beyond certain equally definite limits. Except where relief, soil,

transportation, and man's desires and needs introduce complications, every domestic plant and animal is raised in largest quantities near where its climatic optimum prevails; it becomes less abundant as its climatic limits are approached.

EXERCISES AND PROBLEMS

1. Study the limits of potato production (Fig. 90). On an outline map of the world, insert from Fig. 4 the July isotherms that come nearest to being the northern and southern limits of potato production in the northern hemisphere, and from



Courtesy of U. S. Department of Agriculture.

FIG. 9.—Potato Acreage in the United States.

Fig. 5 the January isotherms that form similar limits in the southern hemisphere. From Fig. 6, using another color, draw the isohyets, or lines of equal rainfall, that separate areas of very scanty or no potato production from those with a fairly large supply. State your conclusions as to the limits of potato culture by temperature and rainfall.

2. Use the data of the preceding exercise together with Figs. 10 (summer rain), and 11 (winter rain) as the basis for a discussion of the climatic optimum of potatoes. Verify your results by reference to the *Geography of the World's Agriculture.*

3. Use the tables in the Appendix as the basis of product maps from which you can draw conclusions as to climatic limits and optima. On an outline map of the U. S. and Canada, insert a series of symbols to show the amount of oats, for example, produced in each state (Table 15). Use Figs. 125 (page 330), 145 (page 373), and 147 (page 375), as models.

Let the symbols and the amounts which they indicate be as follows:

Symbol A	▬	40,000,000 bu.
B	■	20,000,000 bu.
C	▲	8,000,000 bu.
D	○	2,000,000 or less

FIG. 10.—Summer Rainfall. June to August, North of Equator—December to February, South of Equator.

Adapted from *Supan*.

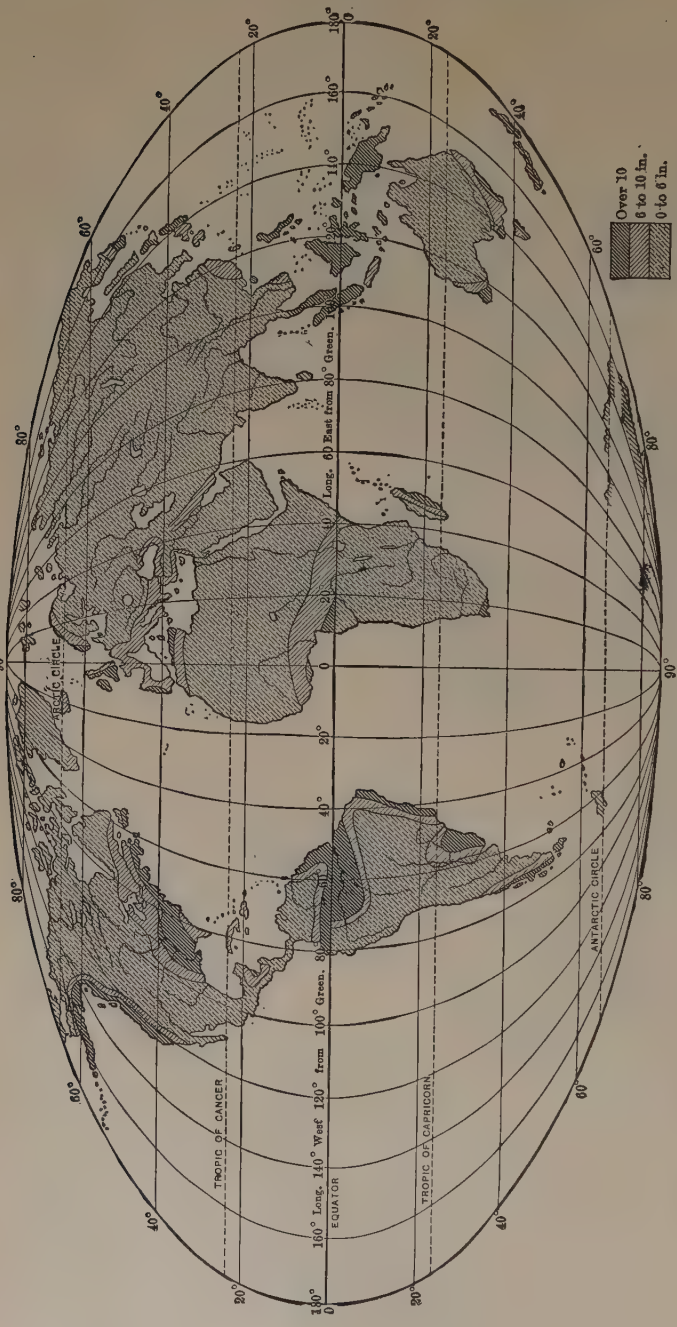


FIG. 11.—Winter Rainfall. December to February, North of Equator—June to August, South of Equator.
Adapted from *Supan*.

Put the symbols in the part of each state where the product is most abundant. Save this map and all others for future use.

Describe the general distribution of your product, and especially its climatic relations. Determine as nearly as possible the following limits beyond which the production of the crop falls to small proportions or ceases: (*a*) lowest mid-summer temperature under which the crop thrives, Fig. 4; (*b*) highest mid-summer temperature; (*c*) lowest annual rainfall, Fig. 6; (*d*) lowest summer rainfall, Fig. 10; (*e*) lowest winter rainfall, Fig. 11. On the basis of these facts describe (*A*) the general climatic conditions under which the crop can grow, and (*B*) the conditions where it is raised most abundantly.

4. Study the product of Exercise 3 by means of another kind of map. From Table 16 insert on another outline map the figures for yield per acre of the product used in Exercise 3. Use ink or indelible pencil and put the figures in the part of each state where the product is most abundant. Draw *isopleths*, or lines of equal production, using Figs. 20 (page 55), 24 (page 71), and 2 (page 13), as models. (See also page xii.) Put the isopleths for oats at the following positions: 25, 30, 35. Remember that *all* the lines must always be inserted even if they practically coalesce.

Now shade your map in four shades, the heaviest indicating a production per acre higher than is indicated by the highest of the lines which we shall hereafter call isopleths, the next between the two highest isopleths, and so on. What difference do you notice between the areas where the total production is greatest and where the yield per acre is greatest? Explain these as far as possible on the basis of (*a*) care in cultivation, (*b*) irrigation, (*c*) relief, and (*d*) density of population.

In general, the regions where a crop is raised most abundantly indicate its optimum climate, provided the conditions of relief, soil, labor, etc., do not interfere. If the places where the yield is greatest per acre differ from those where the total yield is great, it generally means that man somehow provides conditions which artificially give the plants the optimum in other respects beside natural climate. Explain how fertilizers, cultivation, irrigation, and shelter under cloth, such as tobacco receives in the North, bear out this statement.

What advantage do you see in isopleth maps of this kind compared with maps of the kind used in Exercise 3? What disadvantage do you see when the isopleth map gives a single figure for a large state like Texas?

5. Repeat Exercises 3 and 4, but instead of oats in the U. S. use cattle in Europe (Table 13), and instead of yield per acre use animals per square mile (Table 14). Let the symbols indicate the following numbers: *A*, 1,000,000 animals; *B*, 500,000; *C*, 200,000; *D*, 10,000 to 100,000. If there are less then 10,000, use no symbol.

Draw the isopleths at 40, 80, and 120 per square mile. In large countries like Russia, and in countries like Sweden with a great contrast from one part to another, draw your symbols and isopleths in accordance with the distribution of population. (Fig. 1, frontispiece.) Explain the distribution of the animals in relation to climate as in the last exercise, but remember that the optimum for an animal depends not only on the direct effect of the climate, but upon man's need of the animal and also upon the effect of climate and soil on the plants that form the animal's chief food.

6. Make a separate study of sugar, and compare the climatic optima of the two chief plants from which sugar is made.

CHAPTER IV

EFFECT OF RELIEF ON PRODUCTION

Local Character of Effects of Relief.—In regions where there are no marked differences of climate, such as the United States east of the Mississippi and north of the Ohio, the most noteworthy differences in the amount and kind of production are often due to relief. The products of the prairie states of Illinois and Indiana, for example, differ widely from those of the Allegheny Plateau and rugged northern Michigan; the products of a given area in the Berkshires or Adirondacks are not half so abundant and varied as those of an equal area in the lake plain of New York or the Valley of California. The differences due to relief are often evident from mile to mile or even in shorter distances.

Why Rugged Relief Limits Production.—The relief of the lands has a pronounced effect upon both the *amount* and *kind* of products. It has a corresponding effect upon the *density* of the population and upon *habits and character*. Rugged relief reduces the *amount* of production chiefly through (1) the small size and patchy distribution of the arable areas, (2) the thinness and instability of the soil, (3) the difficulty of using improved methods of cultivation, (4) the difficulties of transportation, (5) variations in climate from one level to another, and (6) the sparsity and backwardness of the people.

(1) *Size and Distribution of Arable Areas.*—In rugged regions the size of the level areas generally diminishes as one follows the tributary streams upward. In a typical mountain region with mature topography, the only level land worth mentioning generally lies in the valleys. In a small valley there may be an acre or two here, five acres a quarter of a mile farther down, half an acre in a side valley, and so on. The settler in such a region must choose one of three alternatives: (1) be content with a very small farm all in one place; (2) enlarge his farm by cultivating first the gently sloping land and then the steeper slopes; (3) cultivate several scattered patches of land.

If the settler adopts the last alternative, his land may all be as level, fertile, and easily cultivated as that of the neighboring plain. But he does so at the expense of time and work consumed in going from field

to field, and in carrying his tools, fertilizer, and crops. Thus, even while the population is sparse, the farmer in the rugged lands is at a disadvantage. If the population keeps on increasing after all the level land has been occupied, as it almost invariably does, the farms tend to become smaller. A farmer's three sons may each inherit only one of the level patches farmed by their father. Each son's income is almost sure to be less than that of the father, and the standards of living are likely to decline. This may be obviated by improved methods of agriculture, but comparative poverty, poor transportation, isolation, lack of education, and the emigration of the more energetic young men make it less likely that this will occur in rugged lands than in the plains. A decline in the standard of living may also be obviated by emigration, but the feasibility of this depends on many factors such as the stage of progress, and the language, customs, government, and general friendliness or hostility of neighboring lowlanders. The same result may be achieved by reducing the size of families, but this rarely occurs until the increase of population has actually lowered the general standard of living. Again, the son with a small farm may try to maintain his father's standard of living by cultivating the slopes as well as the level land. But the net result is generally that after a rugged region has been occupied peacefully for a few generations the small size and scattered location of the arable land tend almost inevitably to reduce the productivity of the farmers below that of similar people in a level plain.

(2) *Character of the Soil in Rugged Regions.*—Chemically, the soils of rugged regions may be as good as those of level plains. Physically, however, they are often of low grade. On the slopes the soil often forms merely a slight veneer, resting directly upon the rock with little subsoil. A week's exposure to the hot sun may parch the crops of such a soil, although similar crops in an equal thickness of the same kind of soil in the plains might remain quite moist. The soil of the plain is likely to have a subsoil which supplies moisture to the roots of the plants long after the upper few inches are dry. But note that sunny slopes are quite different from those facing poleward. In parts of France, for example, the sweetest grapes with the richest color are often grown on southward facing slopes, whereas the more shady, cooler, and moister northern slopes are used mainly for trees and grass. In southern Connecticut, for example, near New Haven, certain south-facing slopes are so sunny and dry that they have little vegetation and carry an abundant growth of cactus like that of the semi-arid West.

In general, the soil of slopes is apt to be of coarser grain than that of plains. The rains wash away many of the finer particles, leaving a

more or less sandy or gravelly soil with many bits of partly decomposed rock. Such a soil is relatively infertile, and likewise hard to cultivate. A more serious handicap is the tendency of the rains to cause gullies, even where the slopes are not very steep. Thousands of small, steep-sided gullies have been worn in carelessly cultivated hillsides in the Carolinas, Georgia, Alabama, Mississippi, Palestine, China and many other regions.

(3) *Difficulties of Cultivation on Slopes.*—Another difficulty in rugged regions is that the soil is hard to cultivate. Even if the farmer clears away the stones, a flood, avalanche, or ordinary rain may bring down more. In Tibet, for centuries, the women have gone over many of the fields almost yearly, picking out the stones and throwing them over their shoulders into baskets strapped on their backs. Another great difficulty is that in a rugged region machinery is usually impracticable. It cannot be bought, as a rule, because of the prevalent poverty, nor can neighbors easily combine to buy it for they are ignorant and the bad roads keep them isolated. It cannot be used with profit where the fields are small, interrupted by gullies, and often steeply sloping. Even a scythe is much harder to use on a slope than on the level, and the labor required to harvest grain or hay is correspondingly increased. Suppose the farmer laboriously builds terraces to make his slopes level. He can rarely use machinery, for only on extremely gentle slopes will the terraces be large enough. An abundance of terraces, as in Syria, Peru, Java, China, and Japan, is generally a sign of a low standard of living. It means that people have to do a great amount of painstaking labor by hand.

(4) *Transportation and Relief.*—The difficulties of transportation in rugged regions likewise tend to keep production at a low level. The construction of roads in a rough country is very expensive. The roads must be winding and hence long; there must be much cutting and filling; and bridges and culverts must be numerous. Maintenance is equally costly, for the rains rapidly wash away the surface of the roads, and damage bridges and other portions. Again, either the number of people to be served by the roads is smaller than in the plains, or else the people are almost sure to be so poor, ignorant, and backward that they cannot afford to build roads and often do not realize how much they would be helped by them. The same conditions apply to railroads. But the lack of roads and the sparsity or poverty of the population mean also lack of markets. Hence, even if a man is able to raise more than his family needs, it does not pay, for his neighbors will not buy it, and the cost of taking it to market may be more than the price he can get for it.

(5) *Relief and Climate.*—Since the air normally becomes cooler as the altitude increases, climate and relief are inextricably connected. The cooling effect of altitude may be highly favorable, as in tropical plateaus like that of Mexico. It may also be unfavorable, as in southern Utah where beautiful rolling plateaus at a height of 7000 to 9000 feet are covered with pines, making a delightful park-like effect. There is no cultivation, however, because the summers are short and cool. Hence almost the only products are wool and mutton, which are probably not a tenth as valuable as the crops that might be produced if the relief were less and the plateau stood at a lower level, provided this could happen without diminution of rainfall. Taking the world as a whole, however, the effect of high altitude in increasing human activity and productivity in the great tropical plateaus is probably greater than the effect in reducing production in plateaus of higher latitudes such as Scandinavia, the Rocky Mountain region, and Greenland. Except in tropical plateaus, rugged relief generally tends not only to *reduce the total amount of production, but to reduce the amount that can be produced by the labor of a single individual.*

Effect of Relief on Density of Population in Colorado.—Man is one of nature's products—the chief product to be sure, and differing enormously from all the others. Nevertheless, in many respects man is subject to the same laws as the others. In the present case, the law with which we are dealing is that rugged relief tends to diminish the amount of production. It likewise tends to diminish the density of population. Many of the chief reasons for this have already been given. Let us look at an example. The whole state of Colorado is relatively dry, and hence has a sparse population, averaging only 9 per square mile in 1920. The western half, because of its relief, has considerably more rain than the eastern. Other things being equal, it ought to have a denser population, but the opposite is clearly the case, as appears in Fig. 12. In the western half where the Rocky Mountains give rise to a highly rugged topography, the average density of population is generally less than 5 per square mile, and in one county falls to 0.6. Only in three isolated areas is the population denser than

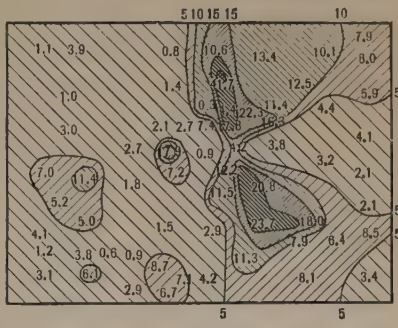


FIG. 12.—Population per Square Mile in Colorado, 1920.

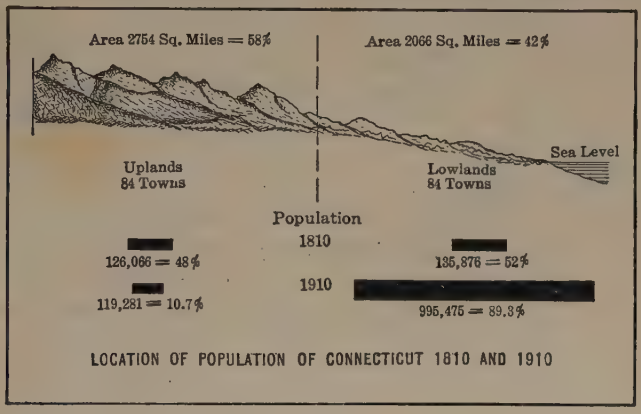
5 per square mile. The most central of these contains the mining community of Leadville; the other two contain considerable areas of level land where irrigation is possible, in the Uncompahgre Valley in the west and the Rio Grande Valley in the south. The desire to utilize nearly 150,000 acres of level land in the Uncompahgre Valley led to the construction of a 6-mile tunnel under a mountain, thus bringing the abundant water of the Gunnison River out of its narrow valley to a place where it can be used. If we omit these three areas, the mountainous and relatively rainy western half of Colorado has only 2 or 3 people per square mile, and the population is decreasing.

The eastern half presents a different aspect. Along the base of the mountains, where streams are available for irrigation, it not only has a string of cities—Greeley, Boulder, Denver, Colorado Springs, and Pueblo—but it has a population of more than 10 per square mile in many counties which have no cities of any importance. Even in the driest portions, far from the mountains, no county has less than 2.1 per square mile, or $3\frac{1}{2}$ times as many as the most sparsely settled parts of the moister mountains. The relief of the land outbalances the effect of climate so fully that, if the cities are included, the drier but level eastern half of Colorado averages nearly 14 people per square mile, in contrast to only 4 in the moister but more rugged western half.

Connecticut versus Indiana: An Example of how Relief Affects Both Population and Production.—As late as 1850, Connecticut was an important producer of farm products. About 57 acres out of every hundred were improved; that is, either under cultivation or forming part of a rotation so that they were sometimes cultivated. In 1920 only 23 acres out of every hundred were improved. With this diminution in cultivation has gone a decline in population in about half the townships, or "towns" as they are called in New England. The decline is limited to the "hill towns" which lie in north and south belts between the valleys of the Thames, Connecticut, and Naugatuck Rivers where the railroads are chiefly located. In 1810 the 84 hill towns were nearly as important as the 84 lowland towns, and had about the same population. (See Fig. 13.) By 1910 the population in the hill towns had decreased, while that of the lowlands had increased sevenfold. Railroads, bringing raw materials and food, have made Connecticut a great industrial state, the eleventh in actual value added by manufacturing, although only the twenty-ninth in population and forty-sixth in area. In value per capita added by manufacturing, it stands second only to Rhode Island. Nevertheless, the farming and small industries of the hill towns have suffered. The decline in agri-

culture does not mean a loss of markets, for in the low parts of the state, both in the valleys and along the coast, a million people must be fed. In fact, in those low parts, where agriculture is profitable, there is more farming than ever before.

The reason the hill towns of Connecticut, and of all the eastern states, have declined in agriculture is simply that rugged land cannot



State Forestry Department of Connecticut.

FIG. 13.—Relief of the Land and Population in Connecticut.
In New England the word "town" is used for "township."

compete with prairies. In Indiana the percentage of improved land in 1920 amounted to 72 compared with 23 in Connecticut and would have been still larger were it not for the hilly southern area and the sand dunes and swamps of the north. This contrast does not necessarily mean that the farmers of Connecticut are less competent or have poorer markets than those of Indiana. Acre for acre, the products of southern New England are more valuable than those of the richest prairie states, as appears in the following table:

State	Average Value of All Crops per Acre of Cultivated Land, in 1919	Average Yield per Acre, in Bushels, 1919		
		Corn	Potatoes	Oats
Connecticut.....	$85	49	75	27
Massachusetts...	77	51	87	30
Indiana.....	40	35	40	31
Iowa.....	42	41	45	34

Because level land is scarce and a splendid market is available close at hand in the manufacturing towns, it pays to cultivate the farms of the northeastern states very carefully, as is the case in Switzerland, Japan, parts of California, and many other rugged lands. Curiously enough, the more advanced a region is, the less likely it is to cultivate rough land. Thus in countries like China, Syria, and Ceylon rough land is cultivated far more generally than in England or New York. Even in the United States some of the most backward areas not only are found where the land is rugged, but have a surprisingly dense rural population. This is notably the case in the Kentucky mountains, as appears in Fig. 14. On the other hand in rugged regions where people do other things, like manufacturing, which pay better than farming, and the rural population is relatively sparse, they can afford to import food from a distance. This is the logical outcome of the great principle that *rugged relief tends to reduce both the total and the per capita production.*

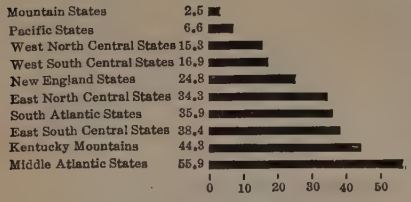

Mountain States 2.5
Pacific States 6.6
West North Central States 15.3
West South Central States 16.9
New England States 24.8
East North Central States 34.3
South Atlantic States 35.9
East South Central States 38.4
Kentucky Mountains 44.3
Middle Atlantic States 55.9
0 10 20 30 40 50

FIG. 14.—Rural Population per Square Mile in the United States, 1920.

How Relief Influences the Nature of Products.—Another principle is that *rugged relief tends to cause man to concentrate his energies upon a certain set of products differing from those upon which he concentrates in the plains.* Among the 32 chief products derived from plants (Table A, page 9) at least 5, namely, wood, olives, coffee, tea, and rubber, are produced more abundantly in rugged regions than in plains. In many countries 7 others, namely, grapes, apples, other orchard fruits, citrus fruits, berries, coconuts, and bananas, are probably as abundant on slopes as on level land. All 12, to be sure, are raised in vast quantities in plains. Nevertheless, where rugged slopes and plains are intermingled, the products named above generally tend to be relegated to the slopes, whereas the level land is occupied mainly by cereals and vegetables, or perhaps by cotton and tobacco.

Among the 11 animal products, sheep, goats, wool, and raw silk are more or less characteristic of fairly rugged topography. Like the corresponding plant products, they are, indeed, produced abundantly in plains, but the tendency to shove them into the more hilly districts is strong. Among the 15 mineral products of Table A, not only water for power, but 6 metals and stone belong mainly to the regions of rugged relief. Iron alone among the metals is derived chiefly from regions of low relief, but even iron comes mostly from old worn-down mountains

which still are sufficiently rough so that they can by no means be called plains. Coal, too, is found in large quantities in regions of at least moderate relief, such as Pennsylvania and Wales, as well as in plains like those of Illinois.

Why Tree Products Predominate in Regions of Rugged Relief.—It will be noticed that all the vegetable products that are especially characteristic of rugged regions are derived from trees, bushes, or woody vines, that is, they are perennials. Moreover, among the animal products, the distribution of silk depends upon that of the mulberry tree. On the other hand, among the remaining vegetable products of Table A, not a single one is derived either from a tree, bush, or woody vine—practically all are annuals. Only in limited amounts are these others planted on slopes of any considerable steepness, and even then they are generally placed on terraces. Does all this mean that slopes are more favorable than level land for the growth of trees, bushes, and woody vines? Only to a small degree. Tea and coffee, to be sure, grow best in well-drained situations at fairly high altitudes and such situations occur mainly in more or less rugged areas. In general, however, level land is better than slopes for almost all kinds of vegetation, because it generally has deeper, richer soil, and is less in danger from drought on the one hand and from erosion on the other. Wood, olives, coffee, tea, rubber, grapes, other fruits, and mulberry trees could all doubtless be raised more profitably in plains than on slopes, as a general rule.

One reason why they are relegated to the slopes is that trees and bushes do not need constant cultivation and other attention. Coffee, for example, requires merely that for each picking the planter go over the land approximately once to cut down the weeds, and once to harvest the berries. Olives require only one visit per year, when they are harvested. Wood requires least of all, for even the finest type of forestry demands only that at intervals of five or ten years the poor wood be cleared out. A main harvest may take place only once in a generation or two. A corn crop, on the contrary, usually requires the farmer to go over the land at least seven times, namely, to spread fertilizer, to plow, to plant, to cultivate at least twice, to harvest the crop, and to remove the stalks. To do this on rugged land is difficult and expensive. If the work is done by hand the difficulties are great enough to be a serious handicap; if horses are used, the difficulties are still greater; while with tractors they are almost insuperable. Yet corn is the best of cereals for rugged regions because it can be planted and reaped fairly easily by hand, which is not true of wheat, oats, and others. Thus the more highly the art of agriculture is developed, the

stronger becomes the tendency to limit the cultivation of annual crops like cereals, vegetables, and cotton, to land that is level.

Another important factor also enters into the matter. As a rule, the most highly valued crop is placed on the land best adapted to it. In California, western Michigan, and western New York, grapes are so profitable that large areas of level land are devoted to them. In Spain, Italy, Greece, and other Mediterranean lands, the cereals are so important as a source of food that they tend to crowd the vineyards out of the level land. In Java, the level lands are so necessary as sources of food for the dense population, that it is forbidden by law to use them for tree crops like rubber and quinine, or even for tea, coffee, and cocoa. Even when the level lands are devoted to so important a food crop as sugar, a given area in Java can be used for this purpose only one year out of three. The government insists that during the other two years the rich level lowlands be used for rice and other staple food crops. As a rule, the cereals, vegetables, and cotton are the most important crops, and hence get first choice of land.

Trees as the Food Producers of Rugged Regions.—People usually think of trees as sources of lumber rather than of food. Yet great amounts of food are derived from trees, and the quantity is increasing. This suggests that the decline in the value of rugged lands for agriculture may cease, and perhaps be reversed. The commonest food product derived from trees is fruit, and fruit trees are well adapted to rugged regions. This is not merely because they need little cultivation, but because one of the great obstacles to fruit raising is late frosts which nip the blossoms in the spring, and early autumn frosts which, to a less extent injure the fruit while ripening. On the lower slopes in rugged regions, frosts do not occur so late in the spring or so early in the autumn as in level regions. At night the earth's surface rapidly gives up its heat, thus cooling the air that is in contact with it. The air thus cooled flows down the slopes and is replaced by warm air. Thus, while heavy frosts may occur in the valley bottoms, the slopes remain relatively warm. This is an additional reason why many farmers plant apples, grapes, and especially peaches on slopes so steep that ordinary cultivation is difficult. In Spain, Italy, and Syria, some of the finest walnut and chestnut groves cover slopes so steep that each tree has to have a little terrace to retain the soil. Again, in the Mediterranean regions, especially from Italy eastward, the olive is one of the main sources of the fatty food which is essential to a good diet. In old Greece there are four olive trees for each inhabitant, and these yield 50 to 80 pounds of preserved olives per person each year and about three gallons of oil. The crop stands next to the small Corinth grape,

or currant, in value, and is of much greater importance as food. It is one of the best crops for a rugged country with a dry summer.

Advantages of Cultivating Trees.—As population increases, and man's standards of living rise, new sources of food and raw materials are constantly required. One possible method of meeting this need, as Professor J. Russell Smith has pointed out, may be to utilize parts of the vast areas of rugged relief. About three-fifths of Tennessee, four-fifths of Japan, and nearly nine-tenths of New England remain untilled, largely because they are rough. Even in the production of lumber these large areas are used only imperfectly and unscientifically. If men were guided by science, and if they were able to see far enough into the future, some of these rugged areas might perhaps become as valuable as the chestnut orchards of France, which are among the most valuable lands in that country. The future of such areas depends partly on the development of quickly growing and highly productive varieties of nut and fruit trees by the same processes which have caused corn, wheat, and many vegetables to yield ten or twenty times as much as in their primitive state. It also depends in large measure on the rapidity with which the earth's population increases, and the degree to which other methods of increasing the food supply are developed.

Importance of Rugged Lands within the Tropics.—What has been said above applies to tropical regions even more than to temperate. In Table A (page 9), only 6 of the world's chief products—sugar, coffee, tea, rubber, coconuts, and bananas—are almost strictly tropical, while 7 others—rice, wood, millet, cotton, sweet potatoes, tobacco, and citrus fruits are raised in tropical as well as other climates. Seven of these 13 products, being produced on trees or bushes, can be raised in rugged regions with relative ease, although not so easily as on plains. On the other hand, among the 16 plant products raised almost entirely outside the tropics only 4 (grapes, orchard fruits, apples, and berries) are well adapted to rugged regions or slopes. The remaining 12 all demand almost level land, or at least only very gentle slopes for their cultivation. This suggests that as man reaches out and utilizes land which has hitherto been too rough for profitable agriculture, the rugged parts of the tropics are more likely to yield a great abundance and variety of products than are those of the cooler climates. In fact, this is just what is happening on the tropical plantations which are now increasing so rapidly in numbers. Sugar plantations, because of their huge demands for transportation, need to be located on level land, but other kinds of plantations are frequently located where the land is at least moderately hilly.

Sheep and Goats, the Most Important Animals of Rugged Regions. —Wild sheep and wild goats are essentially mountain animals. Sheep generally inhabit the more open mountain districts, and goats those that are more rugged and precipitous. In their adaptation to mountains, both sheep and goats are quite unlike cattle, horses, donkeys, camels, and pigs, as appears in the way in which they climb steep slopes to escape their enemies. In the wild state, horses, donkeys, and camels rely mainly on speed in running, for they live in open grassy plains where there is no chance to hide themselves. Wild cattle and pigs, on the other hand, live amid brush and low forest, and therefore rely chiefly upon their ability to hide in the bushes.

In the domestic state all these animals have changed their habits somewhat, and breeds have been developed which thrive under conditions somewhat different from their original habitat. Because plains furnish the greatest supplies of food, all alike can there be supported in greatest numbers. Accordingly, we find large flocks of sheep in plains like those of Argentina and the central United States. Nevertheless, none of the domestic animals has wholly lost its old adaptations. Only one or two highly specialized types of sheep can thrive on level land that is constantly moist, for most varieties develop foot-rot which soon exterminates them.

The majority of domestic sheep are still found in moderately rugged regions (Fig 15). Thus half the sheep of the United States are found in the Rocky Mountain region. In the moist climate of Great Britain, the chalk downs and limestone hills of the south of England, by reason of their altitude and permeability, form some of the most famous sheep "walks" of the country. In proportion to the population, rugged New Zealand has more sheep than any other country; in Australia, the greatest of all sheep countries, aside from Argentina, the sheep live mostly among the rolling hills on the inland slopes back of the escarpments which face the sea.

The distribution of sheep and goats, like that of other products, depends on more than one factor. Climate and the density of population are as important as relief. Sheep thrive best in fairly cool mountainous regions where there is plenty of short, sweet grass, and where the air is often moist and the nights fairly cool, with heavy dews, but where the rainfall is not heavy. Many of the places famous for sheep are rugged regions like the Sierra Nevada and other western mountains where the sheep are driven far into the forest reserves each summer. Even at an altitude of 16,000 to 17,000 feet, the Tibetan shepherds are found crouching under little tents close to perpetual snow.

Civilized man keeps relatively few sheep in the places where the

climate and forage approach most closely to the optimum. In sparsely settled regions, such as the western United States during the last century, and Argentina, Uruguay and Australia today, he may indeed do this, but not for long. As soon as the population becomes dense, sheep-raising tends to be relegated to lands that are not needed for other purposes. Such lands are of three main types, two of which depend upon relief, namely (1) great rugged regions like the Caucasus and Sierra Nevada; (2) limited rugged areas in more favored lands, as in Europe, where Great Britain has more sheep per square mile than any other country in the world; (3) lands too dry for agriculture, as in Australia and Turkey. This type also depends in part upon relief,

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 15.—World Map of Sheep.
Each dot represents 1,000,000 sheep.

for much of the dryness is due to mountains which shut off moisture from the oceans. The sheep is the animal of the poor lands left over when more productive animals and plants have occupied as much as they profitably can, and such lands are likely to be both rugged and dry.

The Relation of Metallic Ores to Relief.—Most ores are found among mountains. Ores commonly take the form of mineral aggregates, often in the shape of veins or lodes, which differ from the surrounding country-rock in that they contain an unusually large percentage of certain metals which are scattered in minute quantities in almost all rocks. The quantity of metallic ores varies greatly from one mountain system to another. In North America the Appalachian system contains relatively little ore aside from low-grade iron. On the other hand, the western mountains contain a great variety and abun-

dance of ores distributed all the way from Alaska to Mexico. A similar condition prevails in Europe. Except for the abundant and excellent iron ores of Sweden, the northwestern mountains from Ireland and Scotland through Scandinavia to Finland contain almost as few ores as do the Appalachians. The Alps likewise supply almost no metals. The only mountains in central or western Europe that contain many ores other than iron are those of Bohemia and the neighboring parts of Germany, but even there the supply is small. Only in the southern penisulas of Spain, Italy, and the Balkans, and in the eastern ranges of the Urals and Caucasus is there a great variety and abundance of metallic ores. Farther east in Turkey, Persia, and Central Asia, valuable ores have been reported in numerous places, although not in such quantities as in similar parts of North America. Corresponding conditions are found in the other continents, namely, few ores in some mountains and many in others. In every case ores are found in greatest variety and abundance not only in regions of rugged relief, but to a large extent in the drier parts of the continents.

Why Ores Are Found among Mountains.—There are at least six reasons why productive metallic ores are largely limited to regions of rugged relief: (1) In rugged regions the earth's surface is deeply gashed by valleys, thus exposing the rocks to a depth of hundreds or thousands of feet. (2) The rocks of rugged regions have generally been much folded and crumpled, thus permitting erosion to expose many formations which even the deepest valleys would otherwise never penetrate. (3) Where the slopes are steep, the soil is thin, and bare rock is exposed so that valuable minerals can easily be discovered. In regions of low relief, on the contrary, the soil is often so deep that no rock is visible for miles. (4) Among mountains there is much erosion, whereby new and deeper layers are brought to light. In level regions the most important geological processes are generally the weathering and deposition of soil, thus covering the underlying rocks deeper and deeper. (5) The heavy metals, gold and platinum, form placer deposits such as those of California and the Urals only where the slopes are steep enough so that the particles of metal can be carried by running water. In such cases flakes or grains of metal from a wide area are brought together by tributary streams and carried in a main stream until it reaches relatively gentle slopes and begins to flow so slowly that the heavy metal falls to the bottom, while much of the stream's load of gravel, sand, and silt is carried further. (6) The most fundamental reason why ores abound in rugged regions is that in such places there has usually been greater opportunity for their formation than in level regions. The formation of ores usually requires that

the earth's crust be pierced by molten masses of igneous rock, or broken by faults, or shattered by the folding and bending of the rocks. Such movements on a large scale occur only where the earth's crust is being upheaved into mountains.

Why Fuels Are Rare in Rugged Regions.—The relation of relief to fuels is quite different from its relation to ores. The original formation of coal, long ago in geological times, seems always to have taken place in regions of very gentle relief. Coal is formed in great swamps which must be surrounded by extensive plains, for otherwise the streams would bring in silt and destroy the purity of the coal. Moreover, if coal is uplifted into mountains, its softness allows it to be rapidly worn away. For these reasons, relatively little of the world's coal is found in genuinely mountainous regions where the rocks have been much folded. Some is found in dissected plateaus like that of western Pennsylvania and Kentucky, where the layers of rock lie almost horizontal. Much also occurs in places like Illinois, England, northeastern France, southern Russia, central Siberia, and northern China, where the relief is gentle. Some, to be sure, is found in genuinely mountainous regions, and the coal that has been subjected to pressure by crustal folding and mountain building forms the best sorts, such as that of Wales, Sakhalin, and especially the anthracite of eastern Pennsylvania. There is not much of this, however, and vast quantities have been lost by erosion.

The occurrence of petroleum is also influenced by relief. Just how this liquid oil and its accompanying gas are formed is not yet certain, but apparently both are derived from plants or animals which flourished in the ocean. Suppose that a region where oceanic deposits are full of the remains of such plants and animals is elevated, broken, crumpled and dissected as in a typical mountain region of high relief. Since both oil and gas move through the pores of many kinds of rock with comparative ease, the tilting of the strata and the deep dissection generally allow the supplies of both to seep rapidly away and be lost. Hence, these products are generally characteristic of regions where the folding or bending of the crust has been only enough to form slight but unbroken arches of rock which may be many miles in diameter and only a few dozen feet in height. Because oil and gas are light, they are gradually buoyed up by the water in the rocks and finally accumulate in the top of the arches, provided a porous oil-bearing rock lies under one that is less porous. The rocks above such gently arched strata may be eroded into fairly rugged relief as in the Pennsylvania oil fields, but the valleys must not be deep enough or the rocks so crumpled and broken as to drain away the oil. Thus, new supplies of the fuels are

most likely to be found in regions of low relief or at least of relatively horizontal rocks, just as metallic ores can be most hopefully sought where the relief is rugged. Certain kinds of shale do indeed contain vast quantities of oil, which can be recovered by heating, and it matters little whether such rocks are only a little disturbed as in Colorado or much folded as in Scotland.

EXERCISES AND PROBLEMS

1. Study the effect of relief versus climate upon production as shown by the percentage of improved land in the United States. Insert the figures of Col. A, Table 10, in ink on an outline map. With a pencil apply the following shadings: (*a*) rugged regions, fairly heavy shading but not so dense as to conceal the figures; (*b*) regions of gentle relief, or plains, unshaded. Draw a north and south line to indicate the western boundary of the area where the rainfall is over twenty inches per year and where the climate is consequently favorable to agriculture without irrigation. List the states and their percentages of improved land according to the following four divisions which will appear on your map: (*a*) rugged regions with favorable climate; (*b*) regions of gentle relief with favorable climate; (*c*) rugged regions with unfavorable climate; (*d*) regions of gentle relief with unfavorable climate. From these figures what do you conclude as to the degree to which the amount of improved land is reduced by (*a*) ruggedness, and (*b*) an unfavorable climate?

Explain how peculiar conditions of relief help to explain the low percentage of improved land in Florida, Louisiana, and the Carolinas.

2. Compare the productive area of countries with rugged versus gentle relief. On the basis of Col. A, Table 9, divide the countries of one of the continents into two groups, those that are predominantly rugged, and those that are predominantly of gentle relief. Note that in Table 9, Columns A, B, and C comprise what is commonly called "productive" law. Col. D is either unproductive or unknown.

In the various continents pick out pairs of neighboring countries, such as Chile and Argentina, where the effect of differences in relief is especially evident in Col. A, Table 9. Pick out other pairs where the effect of climate is especially noticeable in determining the percentage of productive land. In the world as a whole, compare the size of the areas that are sparsely populated because of relief and because of climate. Explain.

3. From Table 1, make a list of the independent countries of Africa and Asia. Indicate whether each one is (*a*) mountainous, (*b*) partly mountains and partly plains, or (*c*) level. Can you see any connection between independence and relief?

4. Effect of relief on lumber production. To the list of states prepared in Exercise 1 add the production of lumber per thousand people as given in Table 24. Find the average for each of the four groups of states. How does the relative rank of each group according to these averages compare with the rank according to the percentage of productive land? What two states would it be fair to omit in both cases because their low relief has an effect much like that of rugged relief? Explain.

5. The Abstract of the United States Census under the heading "Farms and Farm Property" gives a table showing the number of acres of "improved land in farms" and the "per cent of farm land improved," that is, the percentage of the total area of the average farm which is in some way cultivated or occupied by buildings. Make

two graphs showing the number of acres and the percentages in 1850 and 1920 in New England and in the East North Central and South Atlantic states. How do the graphs illustrate the effect of relief?

6. On a map of the United States shade in one color and mark (1) the five states having the most sheep in proportion to the inhabitants, and in another color and also mark (1) the five states having proportionally the most dairy cattle (see Table 19). What is the general character of the topography of the sheep and cattle states respectively? Shade the next five of each kind, and mark them (2). Compare the first group with the second group in topography. How much do the two groups overlap. In what kind of state? Shade the next five states of each kind. How much overlapping is there in these groups? Is it among mountains or plains, and in what kind of climate?

CHAPTER V

THE SOIL AND ITS PRODUCTIVITY

General Principles of Soil Relationships.—In ordinary food products and in fibers like cotton, scarcely 1 per cent of the total dry weight is derived from the soil; even in articles like beans, this rises to only about 4 per cent. The remainder, consisting of carbon, nitrogen, oxygen, and hydrogen, is derived directly or indirectly from water or air. This seems to suggest that the importance of the soil is only a few per cent as great as that of climate, upon which the conditions of the air and water mainly depend. But this is not true. The importance of the soil lies not only in the amount but in the great variety of materials that it supplies. Moreover, it is essential as a support for the plants, and as the main medium whereby water and all plant foods except carbon dioxide are brought to the roots of the plants where they can be absorbed. For these reasons the texture of the soil is as important as its chemical composition.

In a general way, the geographical relationships of the soil are like those of relief; that is, variations in its chemical character and physical texture are associated with great differences in both the amount and kind of products, and likewise in the density of population and the habits and character of the people. Soils that are poor, either chemically or in texture, tend to be associated with low production, both in amount and variety, and with a sparse and backward population. Often, however, this general principle seems to be reversed, rich soils frequently being the indirect reason for the concentration of an inefficient type of population, peasants who devote themselves to a few crops and obtain low yields per acre. Poor soils, on the other hand, are often associated with highly progressive people, large yields per acre, and a great variety of crops. This apparent reversal is far too common to be accidental.

As a rule the character of the soil is closely associated with the climate in a broad way, and with the relief more locally. The association with relief is so close that it is often impossible to discriminate between the two.

The Conditions that Make a Soil Valuable.—The value of a soil depends primarily upon its chemical composition and texture. The chemical composition is the main determinant not only of the relative abundance of the chemical ingredients, or plant foods as they are often called, but of the ease with which those ingredients can be dissolved by water and assimilated by plants. The texture largely determines the ease with which the soil can be cultivated by man or penetrated by the roots of plants. It also has much to do with the speed with which the soil becomes warm, and the degree to which it retains water. Extremely fine texture is bad because it makes a soil sticky and difficult to work when wet, and very hard and tough when dry. Roots cannot easily penetrate such a soil, and its capillary attraction is so great that it rapidly becomes dry. Coarse soils, on the other hand, make it difficult for the plants to get enough food. They also permit the water to seep through them very rapidly. On the other hand, unless coarse soils are actually stony or gravelly they are easily worked, they warm up quickly, and they allow the roots to penetrate them easily.

The chemical composition and texture of a soil determine its fitness for agriculture by causing differences in, (1) colloidal structure, (2) digestive capacity, (3) aeration, (4) circulation of water.

(1) *Colloidal Structure.*—Small particles of soil have a special power of holding on their surfaces a jelly-like film of water in which other substances are dissolved. Such films are the chief reason why fine-grained clayey soils stick together and form hard cakes, whereas others of coarser texture will not stick at all. In a clayey soil, although evaporation is rapid, the extremely small capillary openings hold the water away from the roots, so that plants wilt while the soil still contains 8 per cent of its possible moisture content, whereas in sandy soils the wilting-point may not be reached till the soil water is reduced to 1 per cent. Roughly speaking, a fertile soil is one where the supply of new materials set free by decay or solution, or furnished by fertilizers, is great enough so that the colloids are continually replenished and therefore easily give up their substances to the plants.

(2) *Digestive Capacity.*—A good soil must not only supply abundant inorganic materials, but must "digest" the organic materials which come to it from plants and animals. This is done by means of bacteria, enzymes, and processes of oxidation. Soils differ greatly in their capacity to digest food and to supply it to crops. Some seem able to meet the demands of a single crop grown continuously year after year. Others give satisfactory yields only at intervals, after other crops have been raised in intervening years. In some soils with weak digestive

processes, toxic substances accumulate and poison certain plants. The same substance may poison one plant and be good for another. Fertilizers often help in eliminating these toxins, as well as in supplying materials needed for growth.

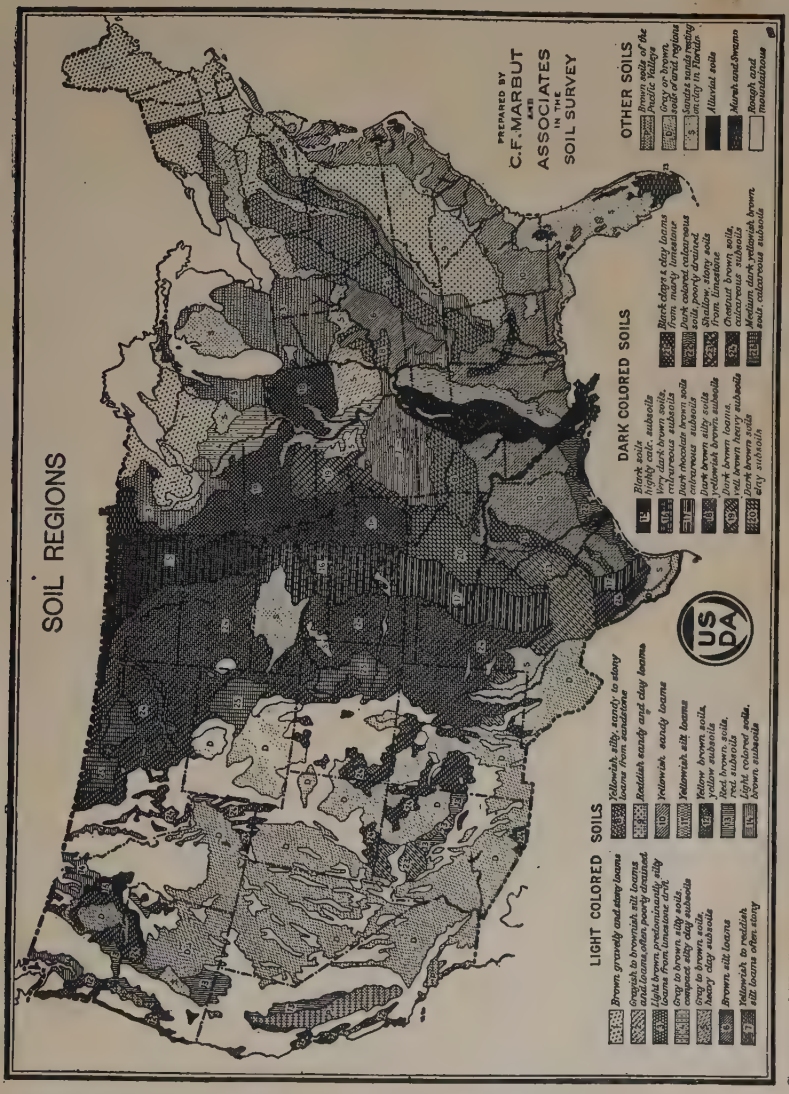
(3) *Aeration.*—Soils need air almost as much as do plants and animals. Many soils breathe, so to speak, even to a depth of 50 feet. This facilitates decay, thus rendering new materials available for the colloids; it facilitates the digestive processes and helps to oxidize harmful toxins and other substances. Drainage and plowing are important means of improving soils by giving them better aeration.

(4) *Circulation of Water.*—In all soils water moves both upward and downward. It moves downward between the larger particles, but sometimes its movements are hampered because the soil is too fine-grained, colloidal, and hard. It moves upward in the tiniest capillary openings, especially in dry periods. This upward capillary movement brings large quantities of dissolved salts to the surface. In dry regions these may remain as a deposit, so that the upper soil becomes too saline for cultivation, or is converted into a cake of caliche, a more or less calcareous material almost like limestone. In moister regions the same process enables good soils to draw on fairly deep-seated supplies of ground water in times of drought, and also supplies considerable amounts of plant food. Some investigators believe that capillary attraction causes water to circulate not only in the upper few feet of the soil, but thousands of feet down, thus bringing new plant food to the surface from deep down in the rocks, somewhat as ores are accumulated. The same process, in due time, tends to distribute the various elements of the soil laterally so that a soil may ultimately owe something of its composition to other soils lying miles away. In the same way, through the percolation of water, a soil may undergo important chemical changes when it is raised to higher levels by upheaval of the lands, or when it is drained by man or otherwise suffers a change in its water circulation.

All these conditions show that the soil is by no means so simple a thing as most people suppose. It is highly complex, and is constantly experiencing slow but important changes. A good soil may be converted into a poor one, and again into a good one.

Color as a Criterion of the Soil.—Aside from the texture, the color of a soil is the most obvious means of judging its value, provided it be remembered that in dry climates fairly light-colored soils may be excellent. In Fig. 16 the distribution of the soils in the United States is based largely on color. In a general way, the soils improve in quality as one goes westward, from the coarse-grained, light-colored types of

New England and the Appalachians to the fine-grained, dark soils of the prairie states, especially those extending from the eastern part of the Dakotas southward to Central Texas. Farther west the pale



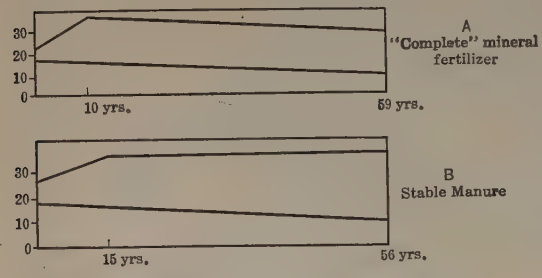
Courtesy of U. S. Department of Agriculture.

FIG. 16.—Soil Map of the United States.

soils of the Rocky Mountain and Pacific regions are partly very fertile because of the dry climate, and partly gravelly and poor. These soils, like others, may belong to one of three types, namely, (1) residual soils derived directly from the weathering of the underlying rocks;

(2) alluvial soils transported by water and deposited in valleys, plains, or bodies of water; and (3) other transported soils, such as glacial soils moved by ice, and eolian soils moved by wind. But no matter what may be its origin, a soil that has been mellowed by weathering to a fine loamy grain, but is not yet leached of its more soluble mineral ingredients, is the best. Such a soil is likely to be dark in color, as in Iowa, especially if it has been formed in a moderately dry climate where the main vegetation is grassy and the lime has not been leached away. In swamps such a soil may be black through the accumulation of humus from decaying vegetation, as in Florida and eastern North Carolina, but it needs aeration before it becomes fertile. In places that are less watery but nevertheless moist enough to support forests, the soil is likely to be of a light and brownish color as in western Ohio. What happens to man on soils of various types will be fully illustrated in the next chapter.

The Use of Fertilizers.—If the same crop is cultivated year after year in a given soil, the yield per acre usually diminishes. This is illustrated in Fig. 17, where the sloping lower line in each section indicates how the yield of wheat falls off when that crop is raised many successive years on the same land without fertilizer. When a so-called "complete" mineral fertilizer is added to the soil, that is, one supposedly containing all the chemical elements needed by wheat in supplement to what it can get from the soil, the yield per acre, as shown in the upper line of section *A* of Fig. 17, increases for some years. It then declines at about the same rate as on the land without fertilizer. In the lower diagram, *B*, where stable manure was used, the yield continued to increase for fifteen years, as appears in the upper line. Thereafter it remained constant, not declining as in the cases where mineral fertilizers or no fertilizer were used.



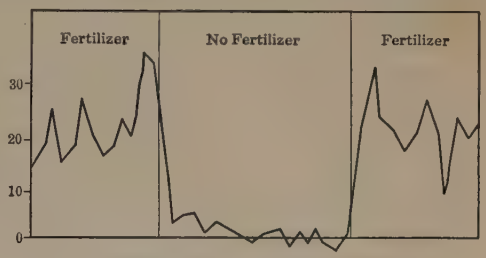
Courtesy of Milton Whitney: Soil and Civilization.

FIG. 17.—Constant Use of Fertilizer on Wheat.

Figure 18 shows in more detail what happens when wheat is raised year after year on the same land, first with a complete mineral fertilizer, then with no fertilizer, and again with mineral fertilizer. The yield in this case, at Rothamsted, England, increased for a dozen years or more; when the fertilizer was cut off it fell to the level that it occupied

before any fertilizer was used; thereafter it declined in the normal fashion so long as no new fertilizer was applied; and then it rose with a new application of fertilizer. Thereafter it declined once more, even though having plenty of fertilizer.

The Deterioration of the Soil.—This brings up a most important geographical problem. How far is deterioration of the soil responsible for the decline of civilization in countries like China, Persia, Mesopotamia, Greece, Rome, Spain, and North Africa, and for the decrease of rural population in New England. Ever since the great German chemist, Liebig, discovered the importance of the chemical elements of the soil in agriculture, many of his followers have agreed with him in supposing that the exhaustion of the soil has been one of the greatest causes of the fall of nations. Others dispute this view. They say that the land which has been longest cultivated is considered the best in almost all countries. They also point out that the yield per acre is generally greatest in old countries where the soil has been cultivated for centuries, whereas it is small in regions where new land has lately been put under cultivation. Let us test this by the following table showing the average yield of wheat per acre from 1921 to 1924 in old regions versus new.



Courtesy of Milton Whitney: Soil and Civilization.

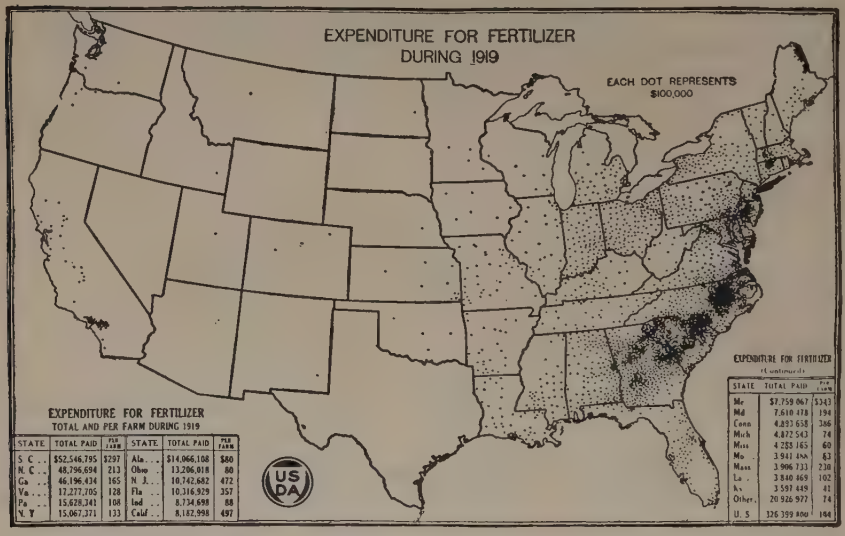
FIG. 18.—Intermittent Use of Fertilizer on Wheat.

YIELD OF WHEAT PER ACRE, 1921–24, ON OLD SOILS VERSUS NEW

Old Regions		New Regions	
Denmark	43.5 bushels	New Zealand	29.0 bushels
Netherlands	41.3	Arizona	25.0
Scotland	39.2	Nevada	24.1
Belgium	38.4	Idaho	23.3
England	32.6	British Columbia	22.2*
Ireland	32.2	Ontario	21.6*
Sweden	28.5	Tasmania	20.4*
Switzerland	26.9	Iowa	19.8
Germany	26.6	Oregon	19.7
China	25.0 est.	Chile	18.4
Norway	23.6	California	18.3
Japan	22.7	Washington	18.3
Average	31.9	Average	21.7

* Latest available years.

On the left the twelve parts of Europe, Asia, and Africa having the highest yields per acre, as given in Table 12 in the Appendix, yield from 22.7 to 43.5 bushels per acre, with an average of 31.9. On the right the twelve best regions in the Americas and Australasia where the land has been cultivated less than one hundred years (Tables 12 and 16), yield from 18.3 to 29.0 bushels per acre, with an average of 21.7. This does not look like deterioration. The fact seems to be that it all depends upon the care given to the soil. If a soil is carefully cultivated, with adequate rotation of crops and with sufficient fertilizer, and



Courtesy of U. S. Department of Agriculture.

FIG. 19.—Expenditure for Fertilizers in the United States, 1919.

especially if manures and sewage rather than mineral fertilizers are constantly applied, the soil may improve from century to century. If the soil is neglected, as it is in the majority of subtropical and tropical countries, it is quite sure to deteriorate with corresponding injury to civilization. In the United States, some measure of the care bestowed on the soil in different sections may be gained from Fig. 19, showing the amount spent for fertilizer. But to this should be added the value of the manure provided on the farms, for which no statistics are available. Nevertheless, we know in general that in the newer parts of the United States, and in the parts with more fertile soil, there is a strong tendency to use all kinds of fertilizers sparingly. This tendency is especially strong among tenants who have no permanent interest in the land.

That is one reason why tenancy (Fig. 20), is an unfavorable indication, so far as progress in agriculture is concerned.

The Utilization of New Soil.—As population increases there is a constant demand for larger supplies of food and raw materials. So far as the soil is concerned, this demand can be met in two chief ways: (1) by using soils that are now uncultivated; (2) by more careful cultivation of soils now in use. Uncultivated soil is found in four kinds of localities: (A) well-populated regions where considerable areas are uncultivated because too poor or too rugged to pay for the work needed to make them productive; (B) tropical regions containing vast areas of unused soil which is often rather poor in quality; (C) cold

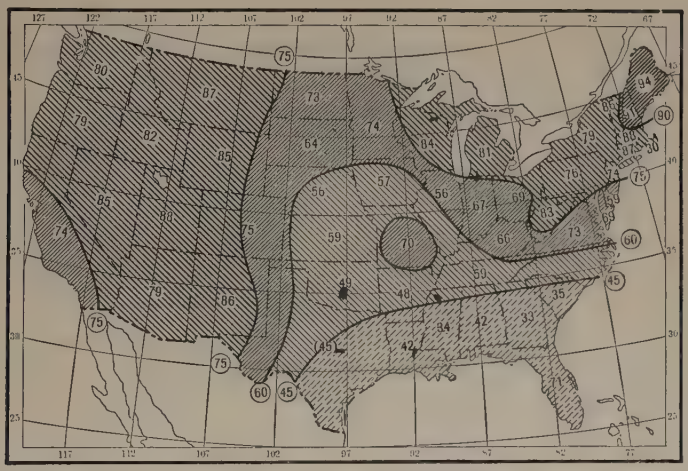


FIG. 20.—Percentage of Farms Worked by Owners in the United States, 1919.

countries where certain glaciated soils are of excellent quality although very irregular in thickness; (D) dry regions which contain enormous areas of wonderfully rich soil.

Poor Tracts in Well-populated Areas.—Which of these four kinds can be most profitably used? To begin near home, in rugged regions like New England, the Appalachian states, and parts of California, many unused tracts lie upon slopes among hills and mountains. Their use is partly a question of fertilizers, partly of finding cheap means of making terraces and using machinery on slopes, and partly of the development of markets. Such regions contain much good soil which might perhaps be profitably used if there were machines which could work on a slope as well as on a level, or which were as effective on small areas as on large. But there are no such machines. Until someone

invents them, the great improvements in modern transportation are likely to make it more profitable to develop distant regions where the relief is not a hindrance. Lowland soils of poor quality are not so difficult to use. In places like Florida and Long Island they may be worth cultivating because of climatic advantages, nearness to a good market, or other special conditions.

Utilization of Dry Areas.—Among the distant regions, those that are cold may be dismissed briefly. Their climate renders their soil almost useless. This leaves the rich soil of dry regions and the poor soil of tropical regions. The dry regions have the advantage not only of wonderful soil, but of a climate which is almost ideal for many plants provided they have water, and which is fairly good for man. Their great need is irrigation. At present nearly 20 million acres are irrigated in the United States, and over 30 million more might be irrigated if capital were available, and if farm prices warranted the expense. At best, however, only about one-fifteenth of the 750 million acres of arid lands in the United States can be irrigated so long as we rely on present methods. The great need is cheaper methods of building and maintaining irrigation works. At present many of the irrigated tracts in the United States, Australia and elsewhere fail to yield a return sufficient to enable the farm to bear the cost of interest, repairs, and upkeep for the irrigation system.

Utilization of Tropical Soils.—The most hopeful source of new land in the immediate future seems to be the vast unused areas within the tropics. Since the warm climate enables more than one crop to be raised each year, such land might yield two or more times as much per acre as similar land in temperate regions. One of the greatest difficulties is the liability of the white man to tropical diseases, and the inefficiency of the natives. This will be discussed in another chapter. A second difficulty is the rapid and continuous growth of weeds, bushes, and especially tough grasses which hinder the growth of everything else. If tropical people were energetic, this could be overcome by plowing, but a good plow is a rare implement in many tropical countries. Moreover, tropical draft animals are generally small and weak, or else, like the water buffalo, can work only in special surroundings, and hence cannot plow through the tough, luxuriant tropical grasses and other growths. Imported animals like the horse and ox deteriorate rapidly. Nevertheless, if labor were efficient, machine plows could be used on a large scale.

The third great difficulty is the poverty of the soil. This can be partly overcome by plowing, which turns up the lower soils, but this is a temporary expedient. The only effective way to maintain or increase

the fertility of tropical soils and thereby gain the advantage of the highly favorable climate, appears to be to supply abundant fertilizers. The poverty of the upper soil, the rapid and persistent growth of weeds, and the development of soil toxins due to poor digestion, are responsible for the fact that in Central America, Central Africa and elsewhere, many tropical fields are cultivated only one or two years and then lie fallow from three to six years to permit the soil to recuperate. This involves an enormous waste of energy, for bushes and trees 10 to 30 feet high grow in the fallow fields and must be cut before each crop is planted.

The Improvement of Old Lands and Utilization of Sewage.—Nature's care of the soil is far better than man's. According to nature's method all plants decay where they grow. Thus they not only return to the soil all that they have taken from it, but the legumes add new materials from the air in the form of humus in which the most valuable part is not the carbon which gives the dark color, but the nitrates made from atmospheric nitrogen. When man reaps the crops and carries them away without using fertilizers, he removes materials which nature cannot replace for a long time. Thus many soils show signs of exhaustion, and the crops grow poorer and poorer. For example, it has been calculated that tobacco exhausts the soil so rapidly that the annual crop in the United States takes from the soil more than 28 million pounds of nitrogen, 29 million pounds of potassium, and about $2\frac{1}{2}$ million pounds of phosphorus. Ordinary food products contain so much plant food that each year the sewage of the United States carries off 600 to 1200 million pounds of nitrogen, 200 to 400 million pounds of potassium, and 80 to 300 pounds of phosphorus. If we could follow the Chinese example without detriment to health, as is probably possible, we should save not only all the chemicals contained in sewage, but in street sweepings, weeds, and all sorts of waste products which we now throw away or burn.

In a few places the sewage of large cities is utilized for agriculture by means of sewage farms. One of the largest examples is at Melbourne in Australia. There the sewage is led some miles from the city and discharged on a level tract near the ocean. Although no such danger actually exists, provided proper precautions are taken, the Australians dare not use this land for vegetables for fear that disease will be transmitted. Accordingly nothing but grass is raised. This grows wonderfully and is used to support large herds of cattle. In Paris the sewage is used for market gardens, especially in the plain of Gennevilliers. The yield of vegetables is enormous. The combination of irrigation and fertilization by the sewage makes it possible to raise ten or eleven

crops from the same land in a single season. Slowly, but surely, this system of utilizing sewage is spreading in the most advanced countries, such as England. If it becomes universal, it will do much to prevent the exhaustion of the soil which is now going on through the vast amounts of food taken from the farms and consumed in the cities.

The Problems of the Fertilizer Business.—Although nitrogen, potassium, and phosphorus are by no means the only plant foods, they are the most important, because they are so easily exhausted. Oxygen, hydrogen, and carbon, to be sure, far exceed them in bulk in all plants, but can always be secured easily from air or water. Calcium (lime), iron, and sulphur are also important, but are present in most soils in sufficient amounts, or can easily be added. Lime is especially valuable. It not only helps to nourish the plants, but often improves the physical structure of the soil, and sweetens it, thus improving the bacterial content and also promoting the decay of the soil and the liberation of potash. Nitrogen, potassium, and phosphorus, on the other hand, are so difficult to procure that the purchase and sale of nitrogen in the form of nitrates, potassium in the form of potash and phosphorus in the form of phosphates is a highly important business. The nitrates involve commerce with Chile and with the Guano islands off the coast of South America, where the supply of this nitrogenous phosphate is nearly exhausted. The task of procuring nitrates demands factories where cotton hulls, garbage, the waste of slaughter houses, and the slag from blast furnaces are treated; it requires the farmer to plow into the soil certain leguminous crops such as clover and alfalfa which form little nitrogenous nodules on their roots. In recent years the need of nitrates has led to the erection of plants like the one at Muscle Shoals on the Tennessee River in Alabama, for the extraction of nitrogen from the air by using water power to develop electricity and thereby combine the nitrogen with lime or other products. The need of potash, which formerly came almost wholly from the vast beds of Stassfurt in Germany, has led to a search of the dry parts of the United States and to the establishment of plants where potash-bearing brines are treated, especially in Nebraska and in the arid states of the Southwest. Large amounts of potash have also been discovered in deep-lying ancient desert beds of Permian age in Texas where oil wells were being drilled.

The phosphates, as well as the nitrates and potash, are the basis of an active industry. Instead of being obliged to go abroad for supplies, however, or to search everywhere for them at home, as in the case of nitrates and potash, the United States is easily able to supply phosphates for export from the large deposits in the rocks of Tennessee and Florida; and also from old bones not large enough for buttons or other manu-

factured products. The need of phosphorus in foods was demonstrated in Wisconsin by feeding animals with rations deficient in phosphorus. It was found that the animals drew the phosphorus they needed from their own bones, which, being thus weakened, were no longer able to support the body and the animals collapsed. Nor did they recover when fed a normal ration.

In spite of all the activities which depend directly on the fertilizer industry, the importance of fertilizers seems to be only in its early stages. The demand is constantly increasing, and presents one of the greatest

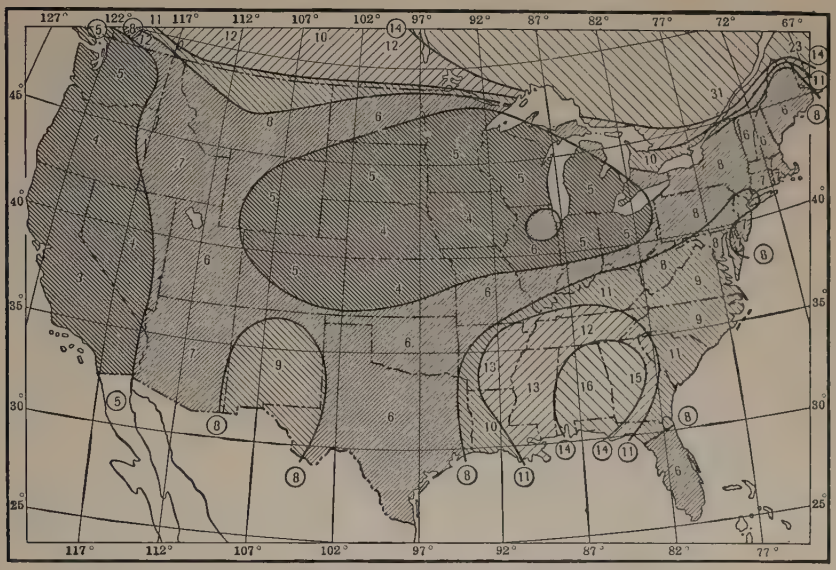


FIG. 21.—Persons per Automobile in the United States in 1924.

In what ways does this map show the effect of soil and relief?

problems of modern chemistry and engineering. The supplies of phosphate rocks of the United States will last a long time, but those of nitrogen and potassium are very limited compared with the probable demands of the future. The greatest source of new supplies seems to be the air for nitrogen and the water of the ocean and the deposits of old salt lakes for potassium. Kelp and other large seaweeds as well as marsh grasses are among the best fertilizers, for they store up much potash derived from the sea. One of the chief difficulties in getting fertilizers from the air and the sea is the vast amount of energy needed for evaporation, chemical changes, mechanical transportation, and deep

mining. If power were sufficiently abundant and cheap, the supply of fertilizers might be indefinitely increased. In this respect, as in many others, the problem of increasing the world's production is closely connected with the question of power. This is true no matter whether we wish to use uncultivated rugged tracts, irrigate the fertile soil of the desert, improve the poor soil of humid and tropical regions, or restore the exhausted soil of the long-settled parts of the world.

EXERCISES AND PROBLEMS

1. Explain the effect of soil and relief on the use of the land. For this purpose make a sketch map of an area near your home showing (*A*) land not used—i.e., in swamps, scrub lands, pasture lands, etc., (*B*) land given over to home sites, (*C*) sustenance sites (improved land and pastures), (*D*) woodlands. Let different students do this, if possible, for a city area, a village area, and a rural area.

2. From soil maps and reports find out as much as possible about the soil of your immediate area.

Find two areas having the same kind of soil; one sloping, another level, and note the differences in use and productivity.

Note any differences in the vegetation of an area of uniform soil and account for them by one or more characteristics other than soil composition.

3. Compare Figs. 8 (corn), 9 (potatoes), 70 (land in crops), 82 (wheat), 92 (vegetables), and 135 (improved land) with Fig. 16 (soil) in order to determine the relation between agriculture and soil. Make a list of ten states where you detect a distinct excess of some crop in a part marked as having a relatively dark soil compared with a part having some other soil. After each state note the names of as many crops as possible which show the beneficial effect of dark soils. Supplement the maps in this book by those in *A Graphic Summary of American Agriculture* or *Geography of the World's Agriculture*. In Figs. 71 (horses), 72 (mules), and 87 (dairy cattle) what relationships to Fig. 16 can you detect? In making these comparisons with the soil map remember that the larger features of the distribution of most products are due to climate and relief more than to soil. Therefore concentrate on features where climate and relief cannot produce much effect.

4. In the list of minerals in Table 26, what fertilizer do you find? Show where it is produced by inserting on a map of the world the values as indicated by the following symbols: ▬ 200 thousand tons, ■ 100, ▲ 40, ○ 10 or less. How far is this fertilizer found in densely populated agricultural countries that have great need of it? What three countries are best supplied in proportion to their needs?

5. Look up nitrate of soda in the encyclopedia or other reference book and find how large a percentage of the supply comes from a single country. Since nitrogen can profitably be taken from the air only where cheap electric power is available, what parts of the United States are likely to supply their own needs for nitrogen fertilizers?

6. Look up potash in the encyclopedia and find what regions have been the great producers of potash in the past and how great is their supply. In 1920 the chief production of potash salts in tons was as follows: Germany, 11,386,000; France, 1,061,000; Nebraska, salt lakes, 84,000; California, salt lakes, 43,000; Utah, salt

lakes, 41,000; remainder of United States from molasses, cement-mill dust, kelp, and all other sources, 17,000, and Abyssinia, 10,000 (estimated). What do you conclude as to the extent to which potash is available near the world's important agricultural regions?

7. What do exercises 4, 5, and 6 show as to the availability of phosphates, nitrates, and potash, and as to the probability that in the future the farmers of the world will have difficulty in getting enough. As to which are the prospects most hopeful?

CHAPTER VI

COMBINED EFFECT OF SOIL AND RELIEF

The Cotton Belt.—It is almost impossible to separate the effects of relief from those of soil. Hence in this chapter, although the soil is the chief partner in most of our examples, it must be remembered that relief also plays an important part. Our purpose is to show how the soil, in conjunction with the relief, influences not only the amount and kind of production, but the habits, economic welfare, and social condition of the inhabitants.

The Cotton Belt of the United States, especially Alabama, is an unusually good example. Alabama, as appears in Map A, Fig. 22, comprises two main divisions. In the northeast the physiographic provinces numbered 1 to 7 consist of old rocks and have a general trend from northeast to southwest. They form a fairly typical cross-section of the Appalachian Mountains, with the old Piedmont lowland at their eastern base, and the Allegheny Plateau and its Highland Rim (the Barrens), on the west. The soils of this division are generally of medium quality, except in the rich Tennessee Valley, and large sections are quite rugged.

The other division consists of roughly parallel belts (8 to 17), which wrap around the old land just described. These form parts of the Atlantic coastal plain, which begins in Long Island, continues down the Atlantic Coast, swings around the southern end of the Appalachians and finally reaches Texas. Its belts, because of differences in the composition and texture of the rocks, and in the length of time that they have been exposed to erosion, differ considerably in both soil and relief. The Central Pine Belts (Nos. 8 and 9), for example, consist largely of non-calcareous strata, and form a moderately hilly country whose comparatively poor soil causes pines to be especially abundant.

Next comes the Black Belt, or central prairie region (No. 10), the most sharply defined division of the coastal plain. Its contrast to its neighbors is the point that chiefly concerns us. It owes its existence to the so-called Selma chalk or rotten limestone. The topography is gently undulating, so that practically all parts can be cultivated. Its "Black Waxy" soil, a gray clay with some sandy loam, is very fertile.

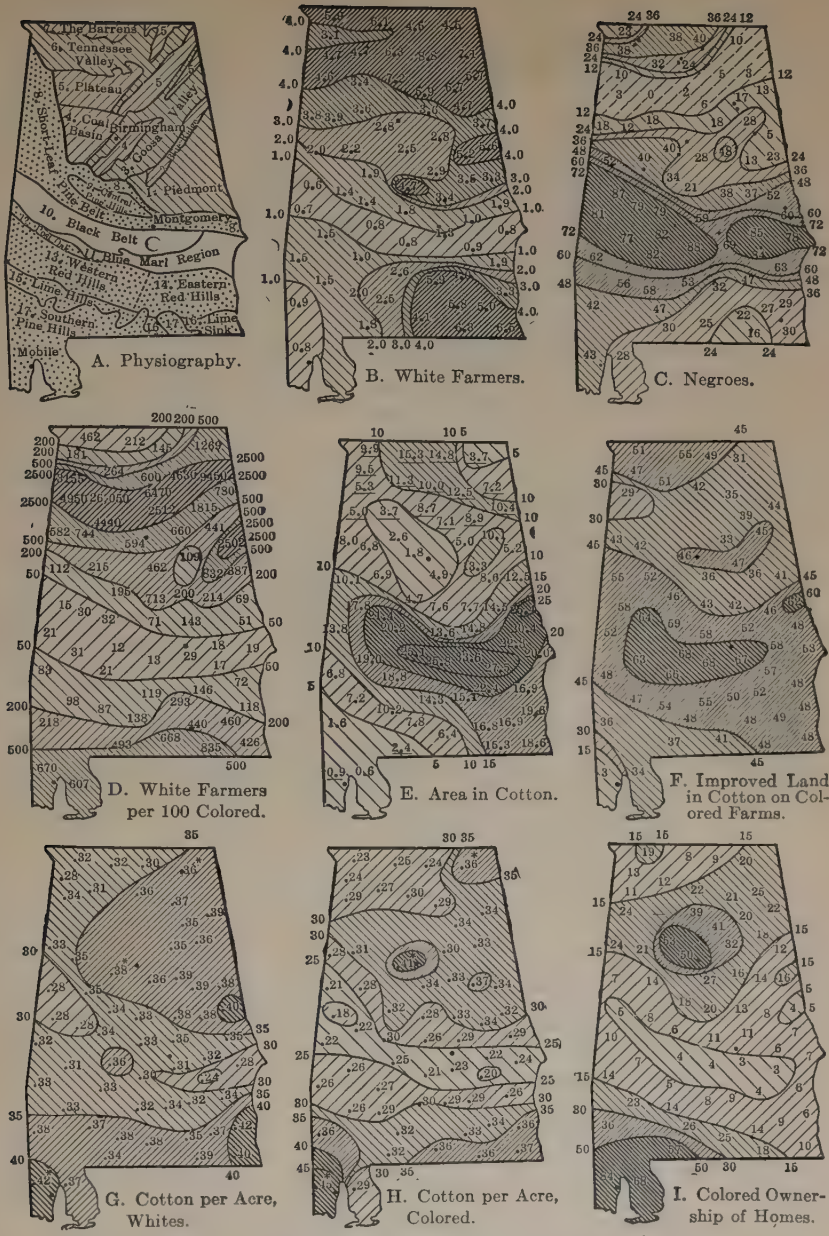

A. Physiography.
B. White Farmers.
C. Negroes.
D. White Farmers per 100 Colored.
E. Area in Cotton.
F. Improved Land in Cotton on Colored Farms.
G. Cotton per Acre, Whites.
H. Cotton per Acre, Colored.
I. Colored Ownership of Homes.

FIG. 22.—Man and the Land in Alabama (Part I).

Note.—The figures indicate data for individual counties. Where no figures appear the activity is either absent or too small to be recorded. The position of Birmingham, Montgomery, and Mobile is indicated on practically every map. Map (C) shows all the larger towns.

A. Physical regions, adapted from R. M. Harper. B. White farmers per square mile, 1920. C. Percentage of negroes, 1910 D. White farmers per 100 colored farmers, 1920. E. Percentage of total area in cotton, 1909. F. Percentage of improved land in cotton among colored farmers, 1909. G. Bales of cotton per acre raised by white farmers, 1909. Asterisks indicate counties where colored farmers raise more than white farmers per acre. H. Bales of cotton per acre on colored farms, 1909. I. Percentage of negro farm homes owned free of mortgage, 1910.

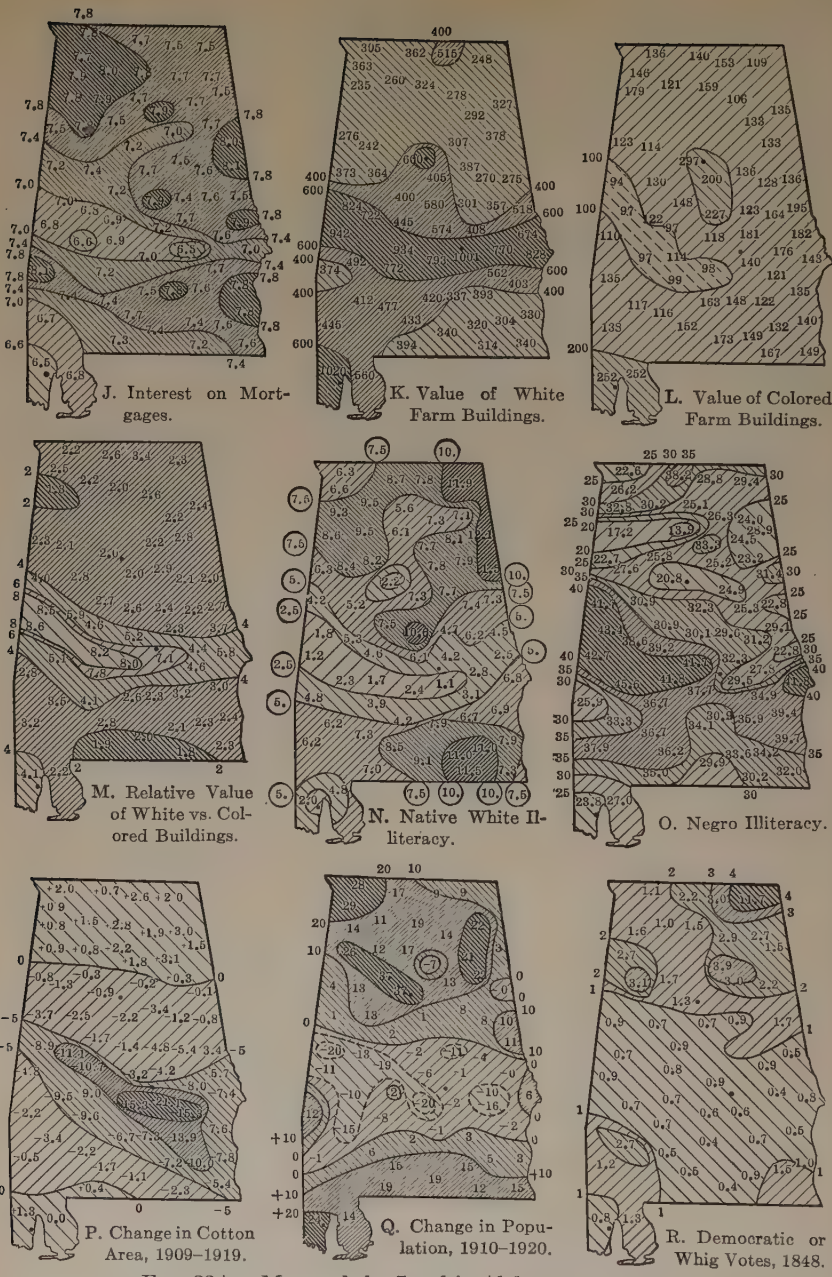

J. Interest on Mortgages.
K. Value of White Farm Buildings.
L. Value of Colored Farm Buildings.
M. Relative Value of White vs. Colored Buildings.
N. Native White Illiteracy.
O. Negro Illiteracy.
P. Change in Cotton Area, 1909–1919.
Q. Change in Population, 1910–1920.
R. Democratic or Whig Votes, 1848.

FIG. 22A.—Men and the Land in Alabama (Part II).

(See note on Fig. 22.)

J. Rate of interest on farm mortgages, 1920. K. Value of white farm buildings, 1910. L. Value of colored farm buildings, 1910. M. Ratio between value of white and colored farm buildings, 1909. N. Percentage of white illiteracy among persons over 10 years of age, 1920. O. Percentage of negro illiteracy among persons over 10 years of age, 1920. P. Change in cotton area, 1909–1919, expressed as percentage of total area of counties. Q. Percentage of gain or loss in population, 1910–1920. R. Votes for Democratic candidate (Cass) per vote for Whig candidate (Taylor), 1848.

Often it is dark in color; this fact, rather than the presence of Negroes, has given rise to the name Black Belt. South of the Black Belt, the level Post-Oak Flatwoods (No. 12) with their stiff clayey soil, are too narrow to have an appreciable effect upon the maps which we shall soon discuss. The hilly Blue Marl region, No. 11, has much good soil, but is not so fertile as the Black Belt.

The Red Hills (13 and 14), on the other hand, are broad enough to be quite important. Their reddish sandy loam is fertile, especially in the west, where agriculture thrives in spite of hills which sometimes rise two hundred feet above the general level. On the other hand, the Lime Hills (15) are not so good, and the southern Pine Hills (17) have a poor, sandy soil. Thus in a broad way Alabama has moderate soils in the northeastern old-land, aside from the Tennessee Valley; poor soils in the Central Pine Belt; remarkably fertile soils in the Black Belt; and finally poor soils in the far south.

The Black Belt and the Distribution of Population.—Map B, Fig. 22, shows that in the Black Belt, where both soil and relief combine to favor agriculture, there is less than one white farmer per square mile. On the other hand, in the rugged plateau sections of the north and on the poor soils of the southeast, there are five to nine white farmers per square mile. Moreover, in the Black Belt the rural population of all kinds, both white and colored, averages less than in most of the other parts of the state. Now contrast the distribution of white farmers with the percentage of Negro population (Map C). The two maps are almost the reverse of one another. This same fact is still more forcibly illustrated in Map D showing the number of white farmers per 100 Negro farmers. The numbers range all the way from 12 in the heart of the Black Belt to 26,050 in parts of the plateau northwest of Birmingham. The contrast between the Black Belt and the plateau is not unique, for similar conditions prevail in many other places, such as the fertile Blue Grass region and the Kentucky mountains. In Fig. 22, notice how often the rich Tennessee Valley and even the Coosa Valley, southwest of Birmingham, reflect on a small scale the same kind of conditions that prevail in the Black Belt.

The contrasts illustrated in Maps B, C, and D bring out a very significant geographical principle: All over the South, the density of the rural white population tends to be low, and the percentage of negroes high, wherever the soil and relief are especially favorable.

Soil and Cotton in Alabama.—In 1909, when cotton culture was at its height, a quarter of the total area of the Black Belt was generally devoted to cotton (Map E, Fig. 22). The percentages of the land devoted to this crop by the whites and the Negroes differed greatly.

The whites had learned not to devote *more* than about a third of their improved land to cotton, even in the Black Belt. The colored people, on the other hand (Map F), almost nowhere in Alabama devoted *less* than a third of the land to cotton, and in the fertile Black Belt about two-thirds. They were "one-crop" farmers with a vengeance, a fact whose significance will be discussed later. Curiously enough, the yield of cotton per acre in the fertile Black Belt, on the farms of both whites and Negroes, is relatively small (Maps G and H). The white farmers, to be sure, raise over 30 per cent more cotton per acre than do their colored neighbors, but this has little to do with the soil. In the Black Belt not only is the soil quite uniform, but the majority of the white owners who have the best land rent it to colored farmers. Thus the difference in yield must be due in large measure to differences in the methods of cultivation. The colored people of the Black Belt raise much more cotton per acre when working under white supervision than when working independently on almost the same kind of land. But under no circumstances do they raise anywhere near so much per acre as do either the colored or white farmers who use the poorer soils. In Alabama, as in many other parts of the world, the best soil often produces the poorest crops because it is carelessly cultivated.

The Black Belt and the Prosperity of Races.—The fertile soil of the Black Belt differentiates that region from its neighbors not only in the character of the population and the kind and amount of crops, but in practically every other phase of human life. For example, Map I shows the percentage of the homes of colored farmers owned, and free from mortgages. The Black Belt stands out conspicuously as an area where less than 5 per cent of the colored people own their homes free from mortgages. Less than 10 per cent own their homes at all. In other words about 90 per cent of the colored farmers are tenants on land belonging to the prosperous white quarter of the population. Although the people whose farms are mortgaged in the Black Belt pay a high rate of interest, they pay less (Map J) than do those in any other part of Alabama except around Mobile, presumably because their fertile land finds ready sale. In many other states, such as Iowa, mortgages on good farm land pay lower rates of interest than those on poor land. This is generally true, regardless of whether the rural population is increasing or decreasing.

Maps K and L, showing the value of farm buildings in 1910,* bring out the fact that the fertility of the Black Belt tends to emphasize the economic difference between the white and colored races. Buildings are better than land as a measure of relative prosperity, for their value

* Latest year for which data by races for individual counties are available.

depends mainly on the cost of erecting them, whereas that of land is greatly influenced by proximity to cities, and lines of communication. In spite of the small yield per acre, the white farmers of the Black Belt (Map K), with their big farms, are by all odds the most prosperous in Alabama, except those near Mobile and Birmingham. Their houses and barns, on an average, are worth about three times as much as those of the white farmers in either the northern portion of the state, aside from Birmingham, or in the southeastern section among the eastern red hills and the sandy pine ridges. This remarkable contrast is evidently associated with the character of the soil. Among the colored people (Map L) exactly the opposite prevails. In much of the Black Belt the farm buildings of the colored people had an average value of scarcely $100 according to the census rating of 1910. Even in the best parts of the state, near Birmingham, the average figure is less than $300. How true this is and how markedly the contrast between the two races is accentuated on the fertile soil of the Black Belt appears in Map M, showing the ratio between the value of the buildings of the white farmers and the colored. In northern and southern Alabama the white farmer's buildings are generally worth not much more than twice as much as those of his colored neighbors. In the Black Belt they are worth anywhere from five to nine times as much. The belt of soil where the white farmers are most prosperous is the very area where the colored farmers are least prosperous.

This remarkable contrast is not a purely local phenomenon; it illustrates a great geographical principle. Where the natural conditions are especially favorable, the contrasts between the more competent and the less competent parts of the population tend to become accentuated. This is true in other parts of the Cotton Belt, and likewise in our great cities, and in one country compared with another.

The Soil, Education, and Leadership.—The effect of the soil upon the distribution of human characteristics appears in another way in Maps N and O. The white people of the Black Belt are distinctly less illiterate than those of any other part of the state. Not even in Birmingham and Mobile is there so good a showing as in four counties of the Black Belt. On the other hand, in the northeastern and southeastern parts of the state where the percentage of colored people (Map C) is small, the degree of illiteracy among the whites is large. Illiteracy among the whites of the South is often ascribed to the retarding influence of Negroes. Neither Alabama nor the other southern states support this idea, for where Negroes are most numerous the white people are the best educated. The same fact is shown by the number of college students. In proportion to the white population,

the counties of the Black Belt stand overwhelmingly ahead of the rest of the state in this respect. They stand equally high in the production of leaders. The Black Belt counties have furnished far more than their proportional share of senators, governors, judges, and leaders in other lines. *Who's Who* for 1924–25 contains approximately one representative for every 985 native whites in Montgomery County, one for 4320 in the other nine counties of the Black Belt, one for 12,310 in the 19 Alabama counties south of the Black Belt, and only one for 13,600 in the populous part of the state to the north.

In education, as in other respects, the Black Belt tends to accentuate opposite qualities among white people and colored. According to Map O the Negroes of the Black Belt are astonishingly illiterate.

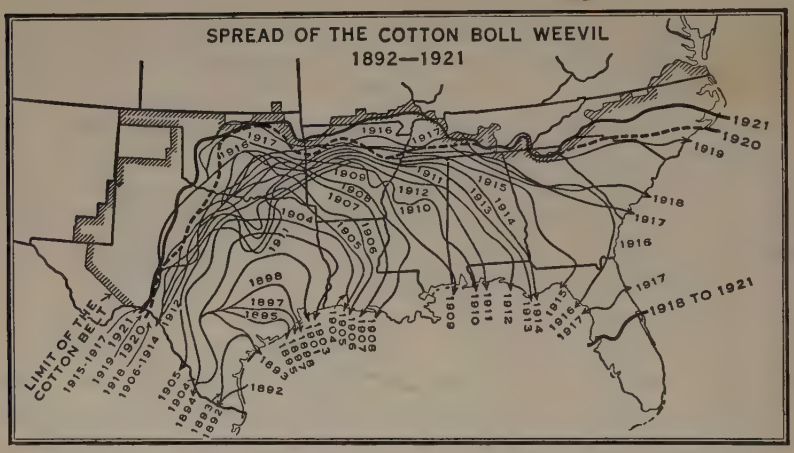


Fig. 23.—Migration of the Boll Weevil.

Practically everywhere, more than 30 per cent of the colored people over ten years of age were recorded as illiterate in 1920, while in some counties the percentage rose to 40.

The Soil and Migrations.—The soil is a potent factor in determining what kind of people remain at home and what kind move away. One of the indirect ways in which it accomplishes this is illustrated in Map P. Between 1909 and 1919 the percentage of improved land devoted to cotton in Montgomery County, for example, fell 21.1 per cent, that is, from 33.6 of the total, to 12.5. This interval coincides almost exactly with the march of the boll weevil across Alabama (Fig. 23). In 1909 the weevil had barely appeared near Mobile; in 1919 it had just completed its course across the state. The decline in cotton acreage occurred in spite of the fact that average prices of 29,

30 and then 38 cents per pound for the cotton crops of 1917, 1918, and 1919 furnished an unusual incentive to raise as much as possible. In northern Alabama, where the boll weevil was just arriving, the farmers responded to this stimulus by putting more land under cotton in 1919 than in 1909. In the far Southwest, which had become adjusted to the boll weevil, the farmers of Mobile County more than doubled their cotton production, although even then it was insignificant. In the Black Belt, however, the boll weevil had done such terrible damage that, even under the stimulus of the highest prices since the Civil War, the farmers devoted only half, or in some cases not much more than a third as much land to cotton in 1919 as in 1909. In other words, because their soil is so favorable to cotton they suffered a really tragic disaster through the coming of the boll weevil. If they had depended on more crops they would have suffered less. It was the colored people who mainly suffered, for in 1909 the whites were already practicing a fairly diversified type of agriculture.

Map Q shows how the soil, through its effect on the distribution of cotton, Negroes, and weevils, caused the effect of the war-time demand for labor to be especially potent in causing migration from the Black Belt. Between 1910 and 1920 the northern and southern parts of Alabama experienced an important increase in population, ranging up to 37 per cent in Jefferson County, containing Birmingham, and 24 per cent in Mobile County. The Black Belt, however, experienced an equally systematic diminution amounting to 20 per cent in some counties. This represents mainly the exodus of Negroes. The boll weevil injured their chances of prosperity at home, and the early stages of the World War temporarily reduced the price of cotton so that those who had depended most fully on cotton were in despair. At the same time the pressure of war-time manufacturing and the consequent high wages offered strong inducements for migration. Some went to the industrial cities of Alabama itself, and many as far north as Chicago. Thus the Black Belt was drained of many of its more energetic and ambitious young Negroes.

How a Fertile Soil is Related to Prosperity and Poverty.—The soil, like the relief of the lands, causes one region to differ from another, partly through its direct effect in favoring one crop or industry and handicapping another, and partly in indirect ways such as the natural selection whereby persons of special types are led to migrate into a region or away from it. In Alabama the fertile soil of the Black Belt seems to have led to the present peculiar distribution of crops, productivity, races, and human characteristics, approximately as follows: When the first white settlers arrived in the South, they soon found the

Black Belt especially fertile. Consequently it was rapidly settled by energetic people who pushed in from the seacoast and from Virginia. In later times, even after all the land was occupied, energetic and far-sighted farmers who had saved money in other parts of the state bought land in the Black Belt. Prices were high, but the land gave rich returns. Thus an uncommonly competent type of white farmer or planter became dominant in the Black Belt. But the climate made it difficult for white men to work in the fields. Therefore African slaves were imported. Their labor was particularly desirable and profitable where the soil was rich. Moreover, the planters of the Black Belt were so prosperous that they could afford to buy slaves. The invention of the cotton gin made it especially desirable to cultivate as much cotton as possible. Hence, even while the white population was still sparse, many Negroes were brought in. The result was a population consisting of a small number of competent and prosperous white planters and a huge proportion of relatively incompetent Negro slaves. Although new white settlers continued to start farms and work them with their own hands in the parts of Alabama where the land is relatively poor, especially after the Civil War, very few came to the Black Belt. It was already well occupied, land was expensive, and the white farmers did not want to compete with Negroes. Thus the old white families have been left almost unmixed in the Black Belt, and retain their leadership to an uncommon degree. One interesting fact about them is their political conservatism. Almost up to the opening of the Civil War they clung to the Whig party, whereas the poorer white people of the rest of Alabama tended to swing to the Democrats, as appears in Map R.

The effect of the Black Belt on Negro migrations was the reverse of the effect on the movements of the whites. The tendency has been for the better Negroes to be excluded from the Black Belt or else to move away. Previous to the Civil War, planters in the northern slave states often raised slaves for sale in the southern cotton-raising districts, but the best slaves were rarely "sold south." It was generally the stupid, disagreeable, or otherwise unfit who were thus sold. The cotton planters in the Black Belt could afford to buy such slaves because the work required of them demanded merely brute strength, ability to endure the sun, and a minimum of intelligence. On the other hand, if an especially intelligent and faithful slave in the Black Belt was able to purchase his freedom or persuade his master to free him, he did not settle in the Black Belt. Land was too expensive, even if anyone had been willing to sell to a Negro. Therefore he went to the poorer lands, either southwest into the sand hills, or northwest to

the rugged areas. In these later days, now that the slaves are free, it is still the more able and energetic negroes who tend to go away from the Black Belt. Moreover, where the proportion of colored people is so large, they have little opportunity to learn through contact with the whites. Thus the net result of the fertility of the Black Belt has been to give it a small population of unusually competent white people and a large population of incompetent colored people. In spite of the twin disasters of the Civil War and the boll weevil, this contrast still persists and permeates the whole economic, social, and political system.

Other Examples of Soils, Migration, and Selection.—Conditions like those of the Black Belt produce similar results all over the world. In Connecticut and Massachusetts the fertile tobacco soils of the Connecticut Valley early attracted settlers from the eastern coast. In later times the farmers of that region became highly prosperous and were leaders in education. The *Springfield Republican*, famous as a local newspaper with a nation-wide circulation, Webster's Dictionary, and a group of colleges including Amherst, Trinity, Wesleyan, Smith, and Mt. Holyoke together with other higher institutions of learning, illustrate the character of the region. But today the old families have largely ceased to farm the land, and in many cases a less competent type of foreign tenant is coming in.

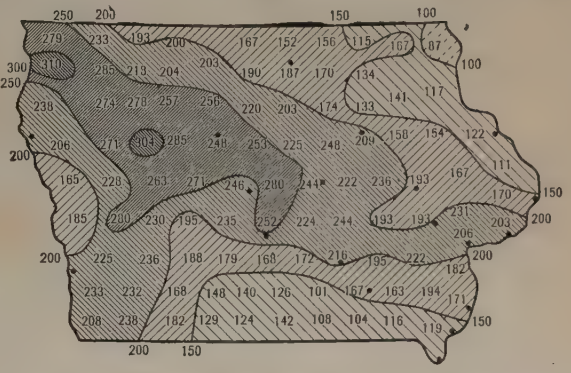


FIG. 24.—Value of Farm Land per Acre in Iowa by Counties, 1920.

Dots indicate cities.

The Imperial Valley of Southern California presents similar conditions. The desert land, irrigated by the Colorado River, is marvelously fertile, but the work on the farms is hard, for the climate is very hot. If a white settler succeeds, as he readily can, provided he is intelligent and industrious, he is apt either to employ Mexicans for the hard work, or to give up running the farm and retire to the cool California coast while his farm is carried on by tenants.

Soils and Social Conditions in Iowa.—The systematic way in which good soils promote tenancy and thereby divide society into landowners and tenants is astonishing. Iowa is generally considered one

of the most uniform states in the union, both physiographically and in the social and economic conditions of its people. Nevertheless, its soil varies considerably in fertility and hence in value, as appears in Fig. 24. Its people vary similarly, as shown by the following table where the counties are grouped according to the average value of the farm land per acre. The presence of cities does not appreciably influence this table, for in the counties which contain the twenty largest cities, the value of the land shows a great range, while its average, $200, is almost identical with that of all the farm land in the state.

LAND VALUES, FARM TENANCY, FARMERS' BIRTHPLACES, AND ILLITERACY IN IOWA, 1920

A	B	C	D	E	F	G
Value of Farm Land per Acre	Average Value of Farm Land per Acre	Number of Counties	Percentage of Farms Worked by Owners	Percentage of Native White Farmers	Percentage of Illiteracy Among Persons Over 10 Years of Age	
					Native Whites	Foreign Born
$87–150	$122	20	68.5	90.4	0.63	6.22
151–175	165	16	59.4	84.5	0.49	4.13
176–200	190	15	57.5	88.8	0.42	4.72
201–225	214	15	52.7	83.4	0.37	4.04
226–250	238	15	52.3	82.4	0.44	4.03
251–310	275	16	47.0	76.5	0.29	2.90

Column D shows that where the value of the land is least (Col. B), which generally means where the soil is poorest, 68.5 per cent of the farms are worked by their owners; on the best land only 47.0 are thus worked, while over half are in the hands of tenants. In the same way, where the land is poor, it is worked by native white farmers almost exclusively, just as in Alabama, the percentage in Col. E being 90.4. But where the land is of very high quality only 76.5 of the farmers are native whites, the remaining quarter being mostly foreign-born. The farmers on the good land, no matter whether they were born in the United States or elsewhere, are better educated than those on the poor land, the percentage of illiteracy in the sixteen counties where the land is worth over $250 per acre being less than half as great as in the twenty where it is worth less than $150. In Iowa as in Alabama, the

character of the soil apparently has a good deal to do with the character and progress of the people.

Ohio's Soil and Progress.—The existence of similar effects of soil and relief in Ohio is illustrated in Figs. 25 and 26. Fig. 25 shows the average value of the farm land per acre. The poorest lands, worth only $20 to $30, lie in the southeast where the edge of the Allegheny plateau gives rise to conditions which mildly reflect those of the Kentucky Mountains. Farther northwest the level land is much

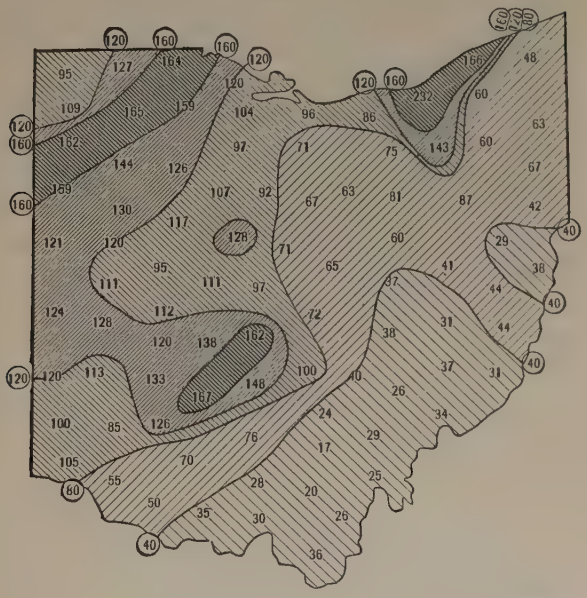


Fig. 25.—Value of Farm Land per Acre in Ohio, 1920.

more productive, the average value per acre rising above $150 in a number of counties. The map of farm tenancy, Fig. 26, displays corresponding areas; its heavily shaded parts indicate that the farms are worked by owners in the east, especially the southeast, in the very places where the land is poorest. On the other hand, in the south central part, where the land is best, light shading in Fig. 26 indicates that many of the farms, more than half in two counties, are worked by tenants.

In Fig. 27, this relation between tenancy and the value of the land is illustrated by another method. The figures at the top indicate the value of the land per acre; those at the left the percentage of tenancy. Each dot represents one of the counties of Ohio. Thus the left-hand

dot stands for Vinton County in the far southeast where the land is worth only $17 per acre, and where 84 per cent of the farms are worked

FIG. 26.—Percentage of Farms Operated by Owners in Ohio, 1920.

This is also a map of tenancy, the heavily shaded area being regions where the percentage of tenancy is high.

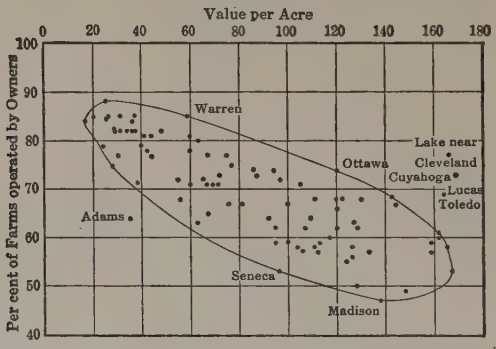


FIG. 27.—Dot Chart of Value of Farm Land per Acre Compared with Percentage of Farms Operated by Owners and Tenants in Ohio.

Each dot indicates a county. Some of the more extreme counties are indicated by name. Note that the two counties on the right which fall farthest outside the oval line are urban.

by their owners. The right-hand dot stands for Cuyahoga County, where Cleveland is located. Its farm land is worth $232 per acre, the

price being greatly raised by the proximity of the great city. Approximately 74 per cent of its farms are run by their owners. If two conditions are so related that they vary exactly together, or in exactly opposite fashion, the dots in such a chart will fall in a slanting line. If they are closely related, but are subject to variations for other reasons, the dots will fall within a more or less elliptical area. That is what happens in Fig. 27. All but four counties fall within the area indicated by the dotted line, which means that the connection between the value of the land and the degree of tenancy is close. The farms in the three counties which stand outside the dotted line on the right are worked by their owners in much larger numbers than would be expected. The reason for their exceptional character is obvious: the high value of their land does not depend upon its fertility nearly so much as upon the fact that Cuyahoga and Lake Counties lie near Cleveland, and Lucas County near Toledo.

In Ohio, as in Iowa, Alabama, and almost every other state, there appears to be a close relationship between the value of the land and the degree of progress so far as that is represented by ability to read and write. This is illustrated in Fig. 28, where the people of Ohio are divided into five rural groups according to the value of the farm land per acre, and into three urban groups according to the size of the communities in which they dwell. The degree of illiteracy among native whites is indicated by the lighter shading. It is high (2.7) in the counties where the farm land, by reason of soil and topography, is worth less than $40 per acre. It is medium (about 1.0) among the rural people who live on the better lands and in small towns of less than 10,000 people; in the great cities it falls to only 0.5.

The high illiteracy among the native whites on the poorer farm lands is not due, as is often supposed, to the sparsity of the rural population, for the differences in this respect are insignificant as appears in the last column of Fig. 28. Except for a few counties near large cities, the rural population of Ohio averages close to 50 per square mile regardless of what the farm land is worth. On the other hand, the illiteracy on the poorer land is doubtless due, in part at least, to scanty opportunities. Because the land is poor, unproductive, and sometimes rugged, the farmers cannot afford good schools, good roads, books, magazines, and other means of progress. But this does not explain why the percentage of illiteracy among the foreign-born (17.7), as well as among the native whites, is much higher on the poor lands than anywhere else. This seems to mean that in Ohio, just as in Kentucky, Alabama, and Iowa, the relatively illiterate and perhaps less competent type of adult newcomer tends to settle in the regions where the land is

least valuable. A relatively well-educated type, on the contrary, tends to settle on the better lands, while a type not quite so well educated goes to the cities. Since a similar relation prevails in many other places, we infer that the character of the land has much to do with picking out one type of person to dwell in one region and another elsewhere.

Soil Fertility and Social Organization in the Old World.—Examples of the way in which a fertile soil fosters the division of society into a small, rich, powerful group of land-owning capitalists, and a large, poor, and uninfluential group of peasant tenants might be cited from Germany, Rumania, Russia, China, or almost any other country of the Old World. "Green England" is a good example. It is the fertile

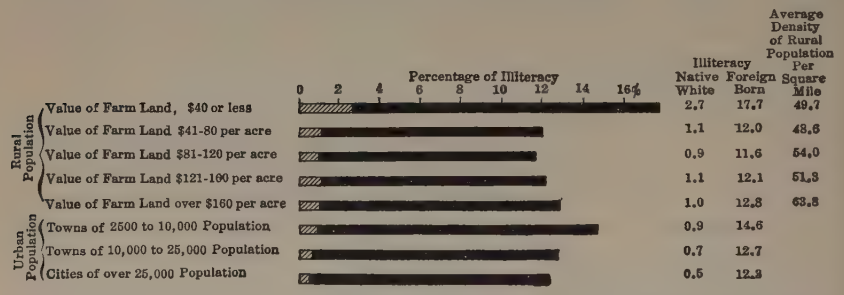


FIG. 28.—Illiteracy in Ohio, 1920, Compared with Value of Farm Land and Size of Towns.

Shading indicates percentage of illiteracy among persons over 10 years of age; light = native whites; dark = foreign born.

southeastern part of the country, where agriculture was long practically the only industry and is still important. There, till recently, lived the richest land owners, the main bulwark of the British aristocracy which has given England the larger portion of its leaders. Around them, as tenants on their broad fields, live the typical English peasantry. "Black England," on the contrary, is the coal-mining highlands where manufacturing is now dominant in cities like Birmingham. It illustrates the way in which the less fertile lands, including those that are more rugged as well as those with poorer soil, tend to become the homes of a type of people intermediate between the land owners and the peasants. Before coal began to be used in large quantities for manufacturing, these people of the poorer lands did not rival the lowland aristocracy in achievement, but they stood well above the simple and relatively ineffective peasants of the lowlands. All over the world the conditions described above seem to tend to cause an aristocratic organization of society to prevail more or less completely

where the soil is especially fertile, whereas a democratic organization is more common where the conditions of agriculture are less favorable. How far all these differences are due to inborn contrasts in the abilities of the different types of people, and how far to their opportunities, no one yet knows, but both factors doubtless play a part.

EXERCISES AND PROBLEMS

1. Study the effect of the soil on the prosperity of Illinois. The 1920 Census shows the following differences between the areas marked A and B in Fig. 29.

	Per Cent of Improved Land in		Yield per Acre, 1919			Animals per Farm		Value per Head	
	A	B	A	B		A	B	A	B
Corn	41.8	33.5	41	17	Horses	8.2	4.2	$103	$73
Wheat	10.3	21.3	19	12	Beef cattle	5.0	3.9	67	51
Barley	0.1	0.1	23	14	Dairy cattle	6.2	4.8	64	59
Rye	0.1	3.0	13	8	Swine	20.8	9.7	20	13
Hay and forage	4.6	16.8	1.8	1.0	Sheep	2.7	2.7	13	11½
Potatoes	0.1	0.1	56	63	Chickens	117	127	1	0.9

	A	B
(1) Density of Rural Population	31	35
(2) Percentage of Foreign-born Farmers	9	3
(3) Percentage of Urban Population	32	19
(4) Average Value of Farms	$60,000	$9,640
(5) Percentage of Tenancy	57	29
(6) Percentage of Illiteracy, Native White	0.9	1.3
(7) Rate of interest on Farm Mortgages	5.4	6.0
(8) Total Mileage of Railways per 1000 sq. miles	204	137
(9) Percentage of Persons 7–13 yrs. of age in school	94.5	94.4
(10) Percentage of Persons 18–20 yrs. of age in school	17.9	11.2
(11) Persons in *Who's Who* per 100,000 population	44.8	4.4

Make a table showing the percentages by which region A surpasses or falls short of region B, using negative signs for disadvantages. To what extent are the differences due to climate? soil? relief? purely human factors? How does Fig. 29, showing yield of corn per acre, help you to judge of the relative importance of soil versus relief, climate and human effort in causing local differences in the prosperity of the farmers? How are you helped by the following facts?

Tuscola lies at an altitude of 653 feet in Douglas County in the southeastern part of the area marked A in Fig. 29. The average value of the farms of that county in 1920 was $53,400 and of farm land $316 per acre. Casey lies at an altitude of 648 feet in Clark County in the northeastern part of the area marked B in Fig. 29. The average value per farm in that county is $9900 and the value per acre $78. These

two places lie less than 40 miles apart. Their rainfall during the growing season is as follows:

	April	May	June	July	Aug.	Sept.	Totals
Tuscola.....	3.5	3.8	3.5	3.7	3.1	3.4	21.0
Casey.....	3.4	3.9	3.7	3.4	3.8	2.8	21.0

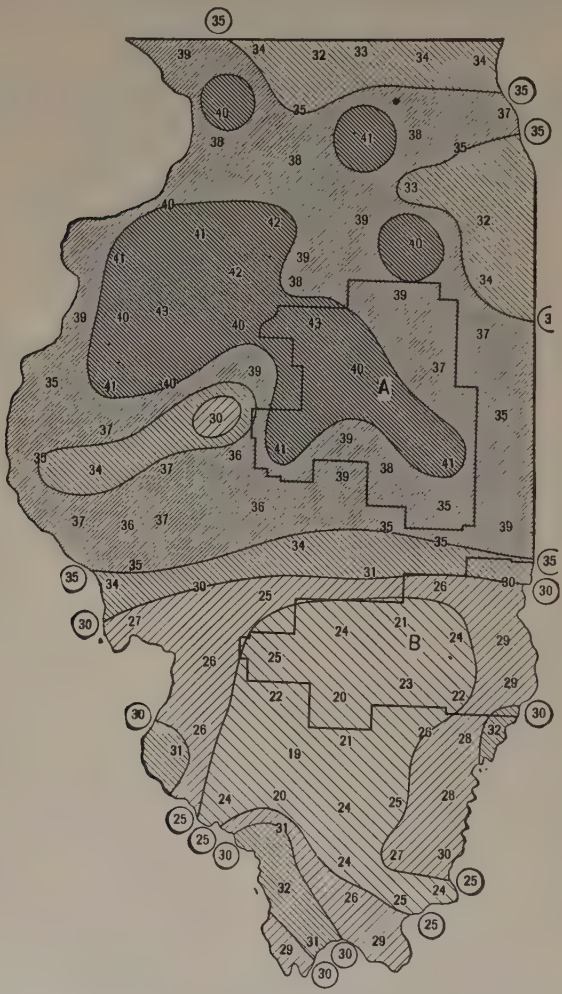


FIG. 29.—Average Yield of Corn per Acre in Illinois, 1915–1924. State Average, 35.

2. Select the 10 counties having the highest average values of farms or of farm land per acre in your own state, and the 10 having the lowest values and compare the two sets of counties in the way that the counties of Illinois are compared in Ex. 1. (See U. S. Census volumes on Agriculture by States.)

3. Make maps like Figs. 12, 24, 25, 26, and 29 for your own state, using the data and *maps* given in the census. Discuss the relation of your maps to soil and relief.

CHAPTER VII

INHERITANCE, SELECTION, AND PRODUCTIVITY

The Magnitude of Differences in Production.—In all phases of the business of life the character of the people is quite as important as the physical environment. The amount accomplished by the average person varies enormously from region to region. In Japan the average coal miner gets out 1400 pounds of coal per day, in the United States 3800. In Shanghai, where Chinese labor is at its best, it frequently takes a carpenter and a boy a day to put a lock on a door, and then it is not well fitted. In America, with a rabbeting machine, an ordinary carpenter puts on a dozen locks. Even with a chisel and hammer, much like the Chinese tools, an average American carpenter can fit 5 or 6 locks in a day. Again, in Shanghai, a mason usually lays only about 300 bricks in an eight-hour day; in the northern United States, with almost the same tools, and with similar plain work without cornices and other difficulties he is expected to lay 1500. This does not mean that the American mason makes five times as many movements as the Chinese. He may make only 50 per cent more movements. He accomplishes far more because his work is well planned. His bricks and mortar are placed exactly where he wants them; he puts on the right amount of mortar at each stroke; his bricks are all of the same size and quality; the board on which he sits can be raised or lowered in a minute or two. In China little attention is paid to any of these items, and a vast amount of time is wasted.

This same type of difference has already been illustrated in Fig. 2, page 13, where we saw that the annual production of the average farmer in Jamaica, for example, is worth scarcely one-thirtieth as much as that of the New Zealand farmer, even when both are reckoned at American prices. Similar, but even greater differences would appear if we were to tabulate the value added by manufacturing. In New Guinea and the Amazon Basin, the manufacturing of the natives consists merely of spasmodic work in making clothes, simple tools, and the like, whereas in Switzerland and Michigan it consists of steady work six days a week in big factories with the help of a great array of complex machines.

Reasons for Differences in Human Productivity.—(1) Inheritance.—We have seen that relief, soils, and climate are all responsible for differences in productivity. Nevertheless, they explain only a part of the contrasts that stand out so clearly in Fig. 2. Other factors also enter into the problem. Among these are (1) inheritance, (2) health, and (3) culture, or stage of civilization. In proportion to their numbers, the hundred thousand Parsees, who live near Bombay, are generally agreed to be the most competent of the so-called racial groups of India, aside from the British. They are largely merchants, and carry on enterprises of a magnitude and quality which we proudly call "European" or "American." The Parsees are distinguished not only in business, but in social customs, philanthropy, education, politics, and religion. A Parsee merchant who had migrated to Hongkong, for example, gave the money to found Hongkong University. Even if we omit higher considerations, the activities of the Parsees tend strongly to increase productivity and commerce, improve transportation, and foster new kinds of industries.

The unusual ability and influence of the Parsees are sometimes ascribed to their culture, that is, their religion, social customs, education, and general mode of life. This is correct, but only people of uncommonly high innate ability could develop and maintain this culture in the face of extreme difficulties. History shows clearly how the Parsees came to possess such ability. As their name implies, they are Persians. In the seventh and eighth centuries A.D., during a period of invasion and conquest, the Persian Zoroastrians were forced to accept Mohammedanism. But a few of the most strong-minded, competent, and persistent "abandoned their houses, gardens, and palaces for the sake of their religion," as the ancient chronicle puts it. After a century of wandering and persecution the surviving remnant finally established themselves in Bombay, partly no doubt, because the good harbor offered facilities for trade, and partly perhaps because a trading town was more likely than others to be hospitable to strangers. The rigid caste system of India has to this day kept them absolutely separate from the surrounding people, and thus they have retained their original inheritance of persistence and ability almost unimpaired. For our purposes, the significant fact is that migration and natural selection concentrated in one small area a group of uncommonly competent and hence productive people, and social isolation has allowed their peculiar racial characteristics to persist more than a thousand years.

The Persistence of a Selected Inheritance in Iceland.—The Icelanders illustrate the same principle as the Parsees, except that their isolation

is physical rather than social. Lord Bryce, perhaps the most famous British ambassador to America, considered the Icelandic sagas the most wonderful and extensive of all primitive literatures aside from that of Greece. They were written nearly a thousand years ago, in a country so cold that practically the only food crop for man is potatoes—about one bushel per inhabitant. The crops of real importance are hay with which to feed great numbers of sheep and a smaller number of horses and cattle through the long, snowy winter, and fish, for many of the farmers are also fishermen. In fact fish are worth about twice as much as the products of agriculture. On the basis of Table A, the Icelandic farmers, from their domestic animals and fish alone, get products worth nearly $1250 per family ($247 per capita). Thus, in spite of a tremendous climatic handicap, the Icelanders get twice as much as the Japanese or Austrians, more than three times as much as the Portuguese, and four times as much as the people of Java and Ceylon with their abundant rain and favorable temperature at all seasons.

The Icelanders still maintain exceptionally high intellectual and cultural standards. Although numbering less than one hundred thousand, they have a university and many other advanced schools, as well as numerous and active religious, philanthropic and scientific societies. Illiteracy is almost unknown. The death rate is lower than in France, Germany, or Switzerland, and is being steadily reduced. Among the eminent persons mentioned in the *Encyclopedia Britannica* and born since 1600, Iceland, in proportion to its population, has a much larger percentage than any other country except Scotland and England. All this means that in spite of a harsh environment Iceland has for a thousand years maintained its place in the front rank of civilization.

The explanation appears to be the same as among the Parsees. The original Icelanders were a highly selected group who left their homes, chiefly in Norway, because they would not submit to injustice. They migrated to a new and relatively uninviting land rather than yield their ancient rights, or become Viking raiders like others of their countrymen. From that time to this, practically no new blood has come to Iceland. Moreover, the dangers attendant on fishing and on caring for sheep among the foggy mountains, moors, and marshes cause the death rate among the young men to be very high. This apparently tends to weed out those who are either physically weak or mentally dull. Thus the Icelanders were not only a highly selected and most able group at first, but their isolation and harsh environment have enabled them to retain those same qualities for a thousand years.

The Effect of Selective Migration on Production in Hawaii.—Hawaii presents a more recent example of the same type. Many of the first white settlers were missionaries who remained after the native Hawaiians had become Christians. They remained partly because Hawaii has a delightful climate, far better than that of most regions in so low a latitude, and partly because of its strategic commercial position and agricultural possibilities. These same conditions attracted other Americans, chiefly merchants, but the remoteness of the islands largely prevented any except successful men with a more or less adventurous and enterprising disposition from bringing their wives and establishing themselves permanently. Moreover, unless the wives had an even greater share of the pioneer qualities than their husbands, they rarely consented to migrate so far. Thus the early American families, as distinguished from the floating population, possessed unusual ability and character, and seem to have transmitted these qualities to their descendants. Under their leadership Hawaii has progressed more rapidly than almost any other region within the tropics. The average annual production per family of farmers (Fig. 2) now amounts to nearly $4000, or almost as much as in Australia and Illinois. Part of this may be due to the immigration of hard-working Chinese, Japanese, and other laborers; but if we omit the sugar and coffee produced on plantations run by Americans, the average production per farm family falls almost to the level of other tropical countries. The unusual innate ability of a comparatively small number of Americans seems to be one of the main reasons why Hawaii is not only marvelously productive, but is the most advanced tropical region in practically every respect.

Migration and Selection in China.—China illustrates the fact that the selection and migration of definite types of people, whose characteristics are inherited by later generations, may hinder as well as help a community. Near Peking, certain poor villages do not raise enough to support themselves even in normal years, and must eke out their living by begging. During a recent famine American relief workers concluded that most of these villagers are mentally subnormal. The explanation seems to be that for generations the brighter, more progressive Chinese have moved away from the villages, especially during the frequent and terrible famines. The duller, stupider ones, on the contrary, have remained behind, partly through lack of initiative, and partly because in the cities or elsewhere they are not able to compete with the multitudes of other people who are seeking work. Thus migration and natural selection have apparently removed from these villages most of the abler people. The great bulk of those who remain

appear to be born with an inheritance of stupidity and apathy, and to grow more incompetent because they are constantly undernourished, and have little opportunity for profitable instruction.

From this same general part of China great numbers of the more enterprising Chinese have in recent generations migrated to Manchuria, where much unoccupied land was available. If the first generation is successful in southern Manchuria, the most enterprising and energetic of the second generation are likely to move farther north, and the third generation still farther. As a result, northern Manchuria is occupied by unusually progressive and energetic Chinese who are said to be quite "European." Their prosperity is doubtless due partly to the new country where they have plenty of room, but also seems to owe a great deal to hereditary ability. The interesting fact about this whole matter is that the almost incredibly dull, stupid, and poverty-stricken people of the poorest villages near Peking are of the same racial stock as the enterprising people of northern Manchuria. Famines and overpopulation in one region have driven away so many competent people that only a weak residue is left, whereas unoccupied land and other opportunities have elsewhere acted as a magnet to attract and concentrate those same competent people.

So far as there is a genuine racial difference between China and the United States, for example, it may perhaps lie largely in the proportion of dull as compared with competent people. The most able Chinese probably vie with the most able Americans, but China appears to have an unusually large percentage of the less competent types. The United States, on the contrary, probably owes part of its progressiveness to the relative scarcity of such types. One reason for the high percentage of dull, plodding people in China seems to be the extremely high death rate in the cities. No exact figures are available, but the death rate among children is extreme, and recent studies suggest that the birth rate is lower than has generally been supposed. When allowance is made for the large proportion of young people, the death rate of even the most healthful American cities is systematically higher and the birth rate lower than in rural districts. In China, as in most oriental and tropical countries, this tendency is so strong that the urban death rate appears appreciably to exceed the birth rate. If the cities were not recruited from the country, they would presumably dwindle away. Thus, when families migrate from the country to the city, the chances are that little by little they will die out. In China, especially in the north, where both droughts and floods are especially destructive, a constant succession of famines for at least two thousand years has not only weakened the people through malnutrition, but has often

depopulated vast areas. The overpopulation and famines together have apparently caused an uncommonly great amount of migration of the more active people from the villages to the cities, and also from north to south, and outward into regions like Manchuria. Thus a multitude of able families appear to have been gradually exterminated by life in the cities, while many others have pushed out into outlying regions, leaving the central parts of North China to be populated in unduly large proportion by less active and competent types. An actual change in the hereditary composition of the people has probably cooperated with the density of population and with social, religious, and political conditions in reducing the productivity of China and making the country conservative.

New Zealand as an Example of Natural Selection.—The same process of natural selection which has helped to make the Chinese of northern Manchuria so active and competent has probably been a factor in making New Zealand one of the most prosperous and progressive of countries. When migration to a new country takes place, there is a strong tendency for those who are physically weak and of a timid temperament to stay at home. On the other hand, among those who migrate, the ones who go farthest are likely to be those with sturdy bodies, strong wills, and a spirit of adventure and initiative. They are also likely to have at least enough money to pay their fare and still have something left to start with in their new homes. In general, this means people who are thrifty and industrious. New Zealand is the most remote of the places to which European colonists have gone in the last century. Apparently that fact has helped to give New Zealand an unusually fine type of colonist. That is one reason why New Zealand stands at the very top in productivity, and is renowned for its progressive social legislation and its general prosperity and comfort.

Migration and Success among American Farmers.—The data of the United States census as to the value of farms in 1920 shed further light on the principle of migration, selection, and the geographical distribution of human ability. The census divides the farmers according to their place of birth, while among those born in the United States the whites are separated from the Negroes and Indians. By uniting a few neighboring countries which rank about the same according to the standard shortly to be discussed, it is possible to distinguish thirteen racial or national groups, represented in most cases by at least a thousand farmers in each of the six divisions into which the census divides the states from New England to the Pacific Coast. In a general way the value of a man's farm is a measure of his success. Of course, an inefficient man may inherit a good farm, and an efficient man may meet

with misfortune, but when large numbers of people are considered, the value of the farms is a fairly good measure of the success of different groups of farmers who live in the same general region.

On this basis Fig. 30 illustrates the relative success of thirteen groups of farmers in six different sections of the United States. In New England, for instance, the 2429 farmers born in Great Britain operate farms worth about $10,700 on an average; the 1924 farmers born in Ireland have farms averaging $10,000 in value; the 617 French,

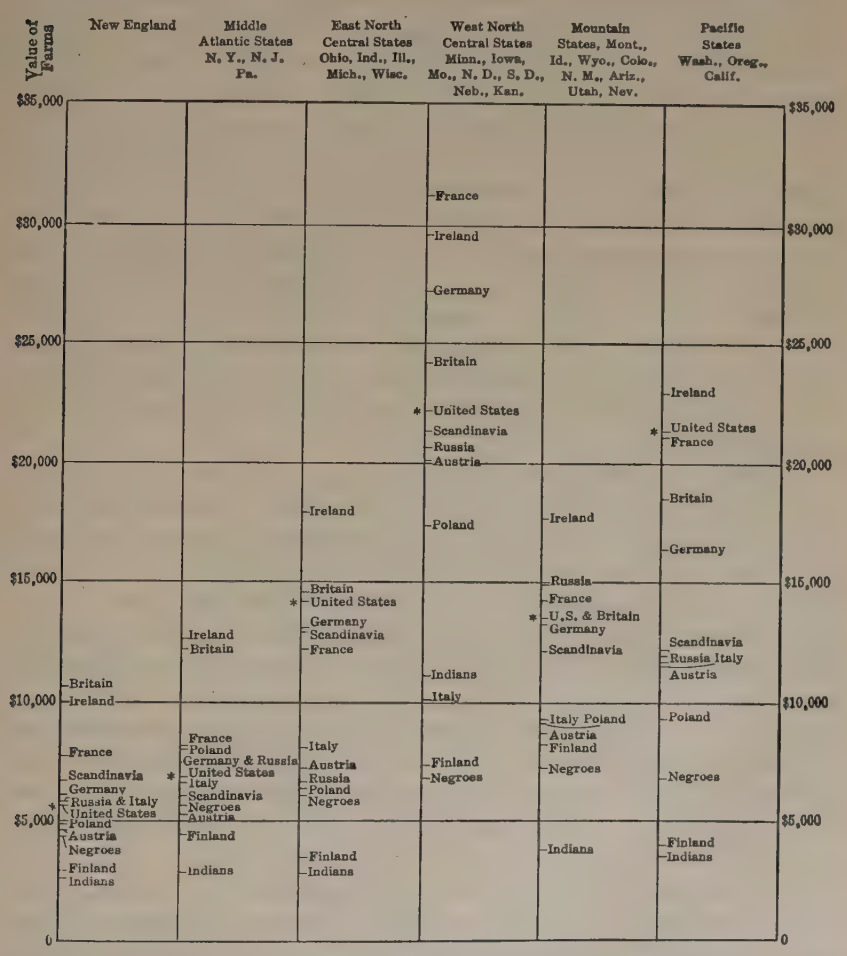


FIG. 30.—Average Value of Farms Operated by Foreign Born and Native Farmers in the United States, 1919.

Holland and Switzerland are included with France, and Hungary with Austria. In the Western States the Japanese, who are too few to be here included, stand at the top.

Dutch, and Swiss (the smallest of our foreign groups), $7800; and so on down to a handful of Indians who operate farms with an average value of only about $2600. On the Pacific Coast the farms of the 2029 farmers born in Ireland have an average value of $28,000; those of the 159,000 native-born whites, $26,300; the 5735 from France, Holland, and Switzerland, $26,000, and so on down to the 1869 Finns whose farms are worth only $4100 apiece, and the 1338 Indian farmers, $3600.

One of the most noteworthy features of Fig. 30 is the increase in the value of the farms from New England westward. This would be quite regular were it not for the exceptionally high values in the West North Central States. These are due largely to an inflation of values which was especially acute in that part of the country when the 1920 census was taken, soon after the World War, and hence may be almost disregarded. The general increase in value from east to west is due in large measure to the newness of the western states, the large size of the farms, and the richness of the virgin soil. Nevertheless, it is also probably due in no inconsiderable measure to the fact that the most energetic young men from the farms of the eastern United States and Europe are often the ones who move farthest west. In other words, the geographical distribution of the value of farms in the United States appears to depend partly on the newness of the country and the density of the population, and partly on the type of farmers as determined by natural selection.

Another noteworthy fact is that the same nationalities and races appear in substantially the same relative position in all the sections of Fig. 30. Note how the Irish, British, and French (with the Dutch and Swiss) maintain their position near the top, whereas the Negroes, Finns, and Indians stand consistently near the bottom. In order to determine the relative rank of each of our thirteen groups for the United States as a whole, we may convert the values of the farms into percentages, calling the value of the average native-white farm 100 per cent in each section. The averages of these percentages for all six sections give the relative values for the United States as a whole, and eliminate any advantage which one race may have because it is numerous in one section rather than another. The final averages appear on the following page:

This does not mean that these nations and races as a whole rank in the above order. It merely means that *among the limited group* who were born in each country or of each race, and who operate farms in the six sections of the United States, the values of the farms stand as indicated. Judging by the countries from which they come, it scarcely seems possible that the Finns as a whole can be only half as competent

Country of Birth	Farm Rank	Rank According to U. S. Army Tests	Rank per "Who's Who"
Ireland	142	123	29
Britain	126	*146	*107
France (with Holland and Switzerland)	114	*143 (Holland)	*63
Germany	101	*139	35
United States: Native Whites	100	*138	*100
Russia	92	113	11
Scandinavia	90	*132	*24
Poland	78	107	5
Italy	76	*110	7
Austria	74	123	*14
United States: Negroes	57	*104	
Finland	45	....	*2
United States: Indians	38		

* The relative positions of these groups are about the same as in the Farm Rank column. The farmers born in Ireland, Russia, and Poland rank higher and the Austrian farmers lower than would be expected from the Army tests based on all parts of the population. The rank per "Who's Who" means the number of persons in "Who's Who" compared with the number of men over 21 years of age. For countries which do not speak English a rank of perhaps 50 is as good as 100 for the English-speaking countries. In this column the unstarred countries all fall lower than would be expected from the farm column. But note that in the columns for the Army tests and "Who's Who" the non-English-speaking foreigners fall in precisely the same order.

as the Scandinavians, or that the Scandinavians rank less than two-thirds as high as the Irish, and only four-fifths as high as the French, Swiss, and Dutch. Nevertheless, these ratios are true among foreign-born persons who have taken up farms in this country in recent decades. The length of time that people have been in this country probably has a little to do with the matter. Nevertheless, as we are dealing only with the actual immigrants, the average length of time that the farmer born in Ireland, England, or Germany has been in this country is not much greater than the average for the Italians, Austrians, and Finns, and probably not a bit greater than for the Scandinavians. Even if the Finns should double the value of their farms by the time they have been here as long as the Irish-born farmers, which is not at all probable, they still would stand no higher than the Scandinavians. Of course, the fact that Irish and British immigrants arrive with a knowledge of English gives them an advantage over other immigrants, but this does not explain why they so greatly surpass the American-born white farmers who often inherit farms instead of having to acquire them. Nor does it explain why the French and German farmers far outrank the Poles, Italians, Austrians, and Finns. The most probable

explanation seems to be that for some reason the selective process which picks out the French and German groups is more rigid than that which picks out the others. It is possible that the differences in the table are partly due to differences in the average ability of different nations and races. It is also possible that the Irish, for example, stand very high because the Irish farmers come from some specially competent geographical section or social class of their country, whereas the immigrants from Finland perhaps come from an unfavorable section or class. Other explanations may also be offered. The point is that when a single occupation like farming is taken, not only are there great differences in the values of the farms and in the amount of production per farmer from section to section in the same country, but there are equally great differences according to the race or nationality of the farmers.

One other feature of Fig. 30 ought to be discussed, namely, the relative position of the native-born white farmers in different sections of the country. Compared with the twelve other races and nationalities, the rank of the white Americans is as follows:

In New England	8
In the Middle Atlantic States	7
In the East North Central States	3
In the West North Central States	5
In the Mountain States	4
In the Pacific States	2

With one exception their position steadily improves from east to west. In New England, in spite of the fact that they know the language and customs from childhood, and in most cases inherit their farms, the white American-born farmers rank only with the Italians and Russians; in California they rank close to the top with the Irish and French. The explanation seems to lie partly in selection. In New England the native white farmers are mainly the residue left after the more energetic and progressive young men have gone to the cities and to farms farther west. Of course many competent men still remain on the farms, but the average is constantly lowered by the outward migration. Thus a relatively inefficient or unprogressive remnant of native white farmers is left behind. They make a poor showing when compared with foreign-born farmers, for it is generally the more energetic and self-reliant type of immigrant who leaves the city and strikes out for himself on the farm. Farther west, however, the native white farmers become a more and more selected group, and their relative position rises correspondingly higher, even though the immigrants who take up farms

in the west are also more highly selected than those who settle in the east. Note, however, that the improvement in the relative position of the native white farmers from east to west, is not regular. It is interrupted in the East North Central States where the native white farmers stand unexpectedly near the top. This is probably because the states of Ohio, Indiana, Illinois, Michigan, and Wisconsin are extremely fortunate in being very rich agriculturally, and at the same time are located close to the splendid markets of huge manufacturing cities. Hence farming is unusually profitable, and therefore keeps the competent young men on the farms more than in the less favored regions either to the east or west.

Although the whole subject of racial character and of the intellectual and temperamental differences between various groups of people is still under discussion, the cases given above seem to illustrate a broad and important principle which we have already seen illustrated in Ohio, Alabama, and other states. Migrations tend to select one kind of people to go away from a country and another kind to stay behind. The differences which thus arise are perpetuated by heredity. The more prolonged, difficult, and dangerous the migration, the higher the general type of people who persist to the end. Thus new countries tend to be inhabited by people of unusual energy, progressiveness, and optimism, as well as of more than the usual physical vigor. On the other hand, countries that have been drained by great streams of migration tend to lose somewhat in all these qualities, as is perhaps especially evident in Ireland, whence emigration has been peculiarly active. As a consequence a frontier country is generally inhabited by a more active, progressive, and productive type of people than the average of those remaining in the regions whence the immigrants were drawn. As time goes on, however, and as migration becomes easier and the process of selection becomes feeble, such differences tend to disappear. Nevertheless, peculiarly attractive conditions, such as the agricultural wealth of the states from Ohio to Iowa, may not only prevent the more able people from migrating, but may continue to attract able people from elsewhere for generation after generation. On the other hand, relatively unattractive regions, like the rough Allegheny plateau, continue to lose their abler young people for decade after decade. Thus migration and selection apparently tend to concentrate competent people in the more favorable or attractive parts of the earth and relatively incompetent and unproductive people in the less attractive regions. But a concentration of able people is often accompanied by a corresponding concentration of incompetent peasants, as in the Black Belt, or laborers, as in the northern manufacturing cities.

EXERCISES AND PROBLEMS

1. Study the distribution of native whites in the United States. Insert the figures from Col. G, Table 2, on an outline map of the United States. Draw isopleths at 60, 70, and 80. Shade so that the areas with more than 80 per cent are darkest and those with less than 60 lightest. How does this map help to explain the fact that the strongest opposition to treaties of alliance with other countries or to the entrance of the United States into European affairs comes from the agricultural regions in the interior of the United States?

2. The distribution of foreign-born immigrants. Draw a similar map of the percentage of foreign-born whites based on Col. H, Table 2, with isopleths at 5, 10, 15, 20, and 25. What effect upon the percentage of foreign-born whites is produced by each of the following conditions: (*a*) nearness to the coast, (*b*) manufacturing, (*c*) nearness to Canada, (*d*) the presence of colored people? Write out your conclusions as to where immigrants go and why.

3. The distribution of colored people. Make a similar isopleth map of the percentage of negroes from Col. I, Table 2. Draw isopleths at 5, 15, 25, 35, and shade in the usual way. In what direction does the number of colored people diminish most gradually? Explain the historical and economic causes of this. Compare this map with the map of the preceding exercise. How do they explain one another? What is the largest percentage of foreign-born whites in any state where the colored population numbers more than 25 per cent? Are there any other states where the percentage of foreign-born whites falls equally low?

4. On the basis of Col. D, Table 15, draw a map of the production of cotton. Shade heavily all the states that produce more than 350,000 bales of cotton, and lightly those producing a smaller amount. How closely does this map agree with the map of colored people? Explain the scarcity of colored people in one important cotton region which lies in two states on either side of a great river.

5. Study the distribution of special races of immigrants in the United States. Select three of the regions from which immigrants come to America, as shown in Table 3, one being a country bordering the North Sea, another some other European country, and a third a non-European country. On isopleth maps of the United States, with isopleths at 10, 20, 30, and 40, show the number of persons from each country per thousand persons in the various states. Shade as usual. Compare the number and distribution of the immigrants of the three races you have chosen. Show why they are found in certain parts of the country. So far as possible point out their relation to (*a*) the sea coast, (*b*) international boundaries, (*c*) manufacturing, (*d*) agriculture, (*e*) the climate of the countries from which they came.

6. Let certain members of the class make large wall maps showing the distribution of each of the types of foreign-born whites in Table 3, and of the negroes from Col. I, Table 2. Where there are a given number of foreign-born whites per thousand population, let the shading in all maps be of the same density. Hang these maps on the wall and compare them. Discuss the relative numbers of different races in each region indicated in Table 2, that is, New England, Middle Atlantic states, etc. Discuss this especially in relation to your own state. Try to find out in what industries the different types of immigrants in your own state are employed.

7. On a map of the world insert the immigration quotas per million inhabitants from Table 1, Col. J. What countries are most favored in proportion to their population? The following places which are not important enough to appear in

Table 1 in the Appendix receive the minimum quota of 100: Andorra, British Togoland, French Togoland, British Cameroon, Liechtenstein, Monaco, Nauru, Ruanda, and Urundi. San Marino, British Samoa, Yap, Greece, Iceland, and New Zealand likewise receive a quota of 100. On the other hand Canada, Mexico, Haiti, Guatemala, Jamaica, Venzuela, Ecuador and all other countries of the western hemisphere have no quotas because practically free immigration is permitted. How far do these facts indicate that the quota law is fulfilling its purpose of permitting only high-grade and easily assimilable immigrants to enter the United States?

CHAPTER VIII

DISTRIBUTION OF HEALTH AND ACTIVITY

The Relation of Health to Civilization.—Other things being equal, people who enjoy good health usually work faster, do more kinds of work, and do better work than those whose health is poor. Healthy people not only produce more, but are more likely to make discoveries and inventions, start new enterprises, and evolve new ideas that lead to

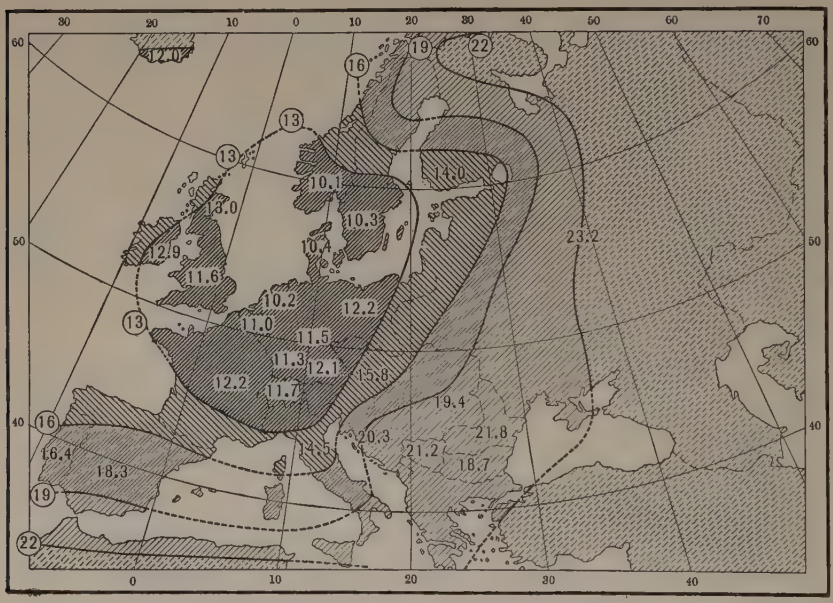


Fig. 31.—Distribution of Health in Europe.

progress. In other words, good health appears to be one of the most important conditions of human activity, productivity, and progress.

Let us compare the distribution of health and of progress in Europe. That continent gives a truer picture than does the United States, for its vital statistics are better, and its population more stable and less migratory. Fig. 31, showing the distribution of health, is based on the death

rate in normal times before the Great War. Deaths are used as the measure of health, because exact data as to illnesses are nowhere available for any large areas. Moreover, long experience has proved that the death rate varies in close harmony with the frequency of all kinds of illnesses, including not only those that are serious, but colds, indigestion, headaches, and the many little ailments which make people stupid, cross, and inefficient, even when they are able to work.

Figure 32 is a map of progress, or civilization, based on the opinion of about 50 leading geographers, ethnologists, historians, and others in 15

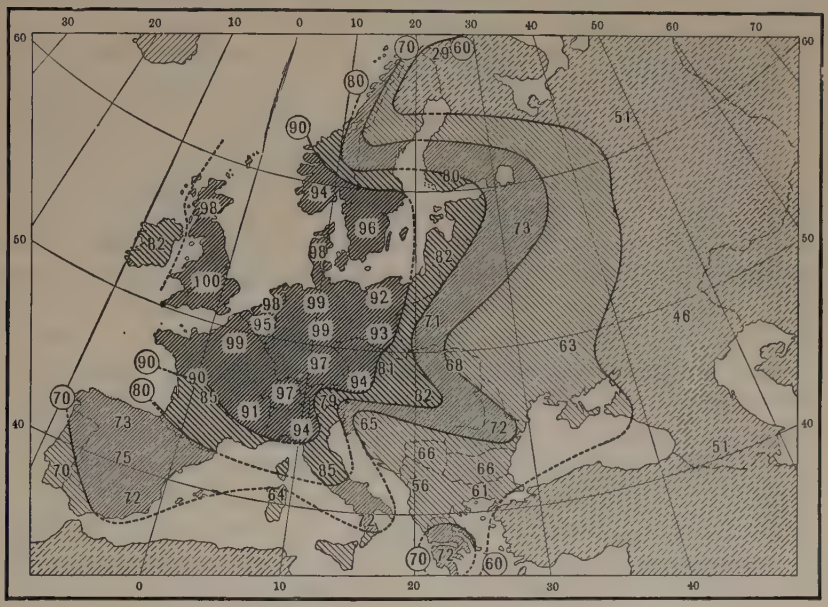


Fig. 32.—Distribution of Civilization in Europe.

countries. These men classified the various regions of Europe according to the following definition of civilization, which is also a statement of the best conditions for business: Civilization means those characteristics which are generally recognized as of the highest value. It depends on " the power of initiative, the capacity for formulating new ideas and for carrying them into effect, the power of self-control, high standards of honesty and morality, the power to lead and control other races, the capacity for disseminating ideas, and other similar qualities which will readily suggest themselves. These qualities find expression in high ideals, respect for law, inventiveness, ability to develop philosophical systems, stability and honesty of government, a highly devel-

oped system of education, the capacity to dominate the less civilized parts of the world, the ability to carry out far-reaching enterprises covering long periods of time and great areas of the earth's surface," and also the power to develop all that is best in literature, religion, and the various forms of art.

Notice how closely the map of civilization agrees with the map of health. Both display the same high area around the North Sea, both decline in every direction from that area, and both have three minor projections toward the Baltic, Black, and Adriatic Seas. Similar maps for other countries make it quite certain that all over the world the distribution of health and progress is essentially the same.

Does this mean that health is primarily due to civilization, or that civilization is due to health? Both positions contain much truth. If two sets of people are equal in health and ability, but one has a high civilization and the other a low, the ones having a high civilization will improve their health more rapidly than the others. But if two sets of people, otherwise absolutely equal, differ greatly in health, the ones with vigorous health will in the long run accomplish the most and make the most rapid progress. The interplay of health and civilization, and their relation to the business of life will appear more clearly as we study the factors which influence the distribution of health.

Factors in the Geographical Distribution of Health.—The geographical distribution of health depends upon many factors, including (1) climate; (2) inheritance; (3) bacteria and other parasitic causes of disease; (4) food, clothing, and shelter; (5) occupations; (6) density of population; and (7) stage of culture, or civilization, especially as manifested in medical and sanitary progress. These are arranged roughly in the order in which man has thus far played a part in determining their geographical distribution. We can change our stage of culture and the density of population with relative ease, and are doing so all the time, but thus far we have not consciously altered our inheritance, and still less our climate. In discussing the geographical relationships of these seven factors we shall leave climate till the next chapter, because it modifies all the others and is not itself appreciably modified by them. In the final analysis the distribution of health and energy conforms to that of climate more nearly than to that of any other factor.

Inheritance and the Health of Tropical Australia.—In certain parts of the world people are unusually healthy and correspondingly productive because they inherit strong physiques. This appears to be the case among the two hundred thousand white people, chiefly of British descent, who live in the tropical part of Australia. Prior to the World War the *adjusted* death rate in Queensland, the warmest, because most northerly

state of Australia, was 12.1. An adjusted death rate is one calculated according to a *standard* population so that allowance is made for the fact that old people are numerous in one place, children in another, and so forth. On the same basis the death rate of New Zealand, the healthiest country in the world, was 10.5; that of Denmark, one of the healthiest countries in Europe, 12.4; of England, 15.2; and of the part of the United States—chiefly the North—then included in the registration area, approximately 16.1. The inhabitants of tropical Queensland are even more vigorous than those of the rest of that state, as appears from the following data for 1920–1922:

	Tropical Queensland	Non-tropical Queensland	Australia as a Whole	United States
Births per 1000 women aged 15–44.....	141	114	107	91
Infant death rate per 1000 births.....	55	56	63	76
Female death rate per 1000 persons.....	7.9	8.0	8.7	11.4
Male death rate per 1000 persons.....	14.0	10.6	11.0	12.0

Among the tropical Queenslanders the number of children in comparison with the number of women is larger than in the non-tropical parts of Queensland, or in Australia as a whole, or in the registration area of the United States at approximately the same period. Yet all of these other places are among the most healthy parts of the world. The percentage of children who die during their first year is also less in tropical Queensland than in the other places, and so is the death rate among women and girls. Only among the men and boys is the death rate higher than in the other regions, but even their rate is lower than in most parts of the world.

Inasmuch as we are here dealing with a matter as to which there is still considerable disagreement, let us see how far the other six factors mentioned above are competent to explain the good health of tropical Australia. The climate can scarcely explain the matter. Townsville, the largest city, boasts that it has the hottest street in the world; even the coolest month is only mildly stimulating, and great heat prevails for nine months each year. Moreover, on the coast, where most of the tropical white Australians have their homes, the summers are oppressively moist as well as hot. Nevertheless, white men do many kinds of work that are considered impossible for them in other tropical countries. They plow the fields, lift heavy bales on the docks, ride after the cattle and sheep, and cut sugar cane under the vertical tropical sun. The women often work in intolerably hot kitchens, among swarms of pestiferous flies, and in rooms where the blazing sun on the unceiled roofs

joins with the kitchen fire to produce a temperature above 100° much of the time, and often up to 115° or even 120°. Such conditions elsewhere, as we shall see in the next chapter, almost invariably lead to poor health, as in Canton, Calcutta, and Bombay in latitudes not greatly different from that of Townsville.

Bacterial diseases, on the other hand, are less harmful in Australia than in almost any other tropical regions except Hawaii and other Pacific islands. Nevertheless, this does not explain the good health of tropical Australia; it merely eliminates parasitic diseases from further consideration, for it means that in northern Australia they do just about the same amount of harm as in the main areas where white people live outside the tropics.

The food, clothing, and shelter of the tropical Australians are much like those of people of British stock elsewhere, but the isolation, climate, and pastoral and mining industries combine to lead the tropical Australians to eat too much meat, too many canned goods, too few vegetables, and too little fruit. Their clothing is frequently too warm, for old habits acquired in cooler climates persist. Moreover, low, unceiled, and unscreened houses are all too common. In comparison with the main regions inhabited by English-speaking people, tropical Australia has a slight disadvantage in respect to food, clothing, and shelter.

The occupations of tropical Australia, the density of population, and the stage of culture may all be ruled out as possible causes of the remarkably low death rate. The rural half of the people are engaged mainly in farming and cattle-raising, with some mining; the other half live in small towns where unhealthful manufacturing occupations are rare. This is good, but it gives no advantage over regions like Iowa, Maine, Arizona, Northern Scotland, and Norway. Yet the death rate in those regions is much higher than in tropical Australia.

After considering all these other factors, the scientists of the Australian Government are convinced that the Australians within the tropics enjoy exceptionally good health mainly because they have been highly selected by the methods described in the last chapter. Persons who are physically weak rarely migrate so far as Australia, and still less to the tropical parts of the country. Thus the tropical Australians are a highly selected group who enjoy good health mainly because the majority were born with unusually good physiques. The same reasoning applies to practically all tropical regions where white men are found. As a rule, only white men of unusually good physical inheritance remain long within the tropics. For that reason such men achieve much more than would be achieved by persons with only ordinary vigor. A similar process of selection concentrates an unusually vigorous population in

other new regions. That is one reason why states like Washington and its neighbor, British Columbia, have remarkably low death rates, remarkably active people, and remarkably great productivity.

Geographical Distribution of Parasitic Diseases.—The great majority of diseases vary greatly in frequency and virulence. Diseases of the respiratory organs, aside from tuberculosis, are much more frequent in winter than in summer, and in dry months than in moist; diseases of the digestive organs show the opposite condition, being prevalent chiefly in summer. The geographical distribution of these diseases accords with the seasonal distribution. In the northern and western parts of the United States the respiratory diseases other than tuberculosis give rise to 8 or 10 per cent of all deaths; in the southeastern part to only 5 to 7 per cent. On the other hand, diseases of the digestive system amount to 8 or 10 per cent of the total on the relatively cool and moist north Atlantic and Pacific coasts, but rise to 12 per cent in the northern interior and to 15 per cent in certain southeastern states such as Mississippi. In tropical countries the death rates from such diseases often rise to very high levels, while many diseases occur which are unknown elsewhere. Diseases, like other manifestations of life, have definite geographical limits and optima. It is almost impossible to state these limits, however, for they depend upon many complex conditions, including the chemical condition of the human blood and tissues, the presence of animals or plants upon which or in which the parasites live during part of their lives, and the effect of atmospheric, nutritional, and other conditions upon both man and the parasites that cause disease.

The Geography of Tuberculosis.—Some parasitic diseases, such as tuberculosis, spread to practically all parts of the world, while others, such as sleeping sickness, are subject to strict geographical limits. Even tuberculosis, however, seems to be less able to do harm at high altitudes than at low and in good air than in bad. Other features of the physical environment influence the geographical distribution of tuberculosis still more strongly, as appears in the following figures showing the relative death rate from tuberculosis of the lungs among English stone cutters who work in regions where different kinds of stone are available. In this case 100 represents the average death rate from tuberculosis among all adult Englishmen, whereas the rate among farmers is 57.

Granite workers	127
Limestone workers	129
Slate quarry workers	220
Sandstone workers	415

The death rate from tuberculosis among stone cutters is everywhere high, but varies greatly according to the degree to which the dust that

gets into the workers' lungs is abundant and sharp, as when sandstone is cut. Other things being equal, the chances that a stone cutter in a sandstone region will break down with tuberculosis and be helpless for years are more than three times as great as they would be if the same man lived in a granite region, and seven times as great as if he lived in a plain where there were no quarries so that he became a farmer.

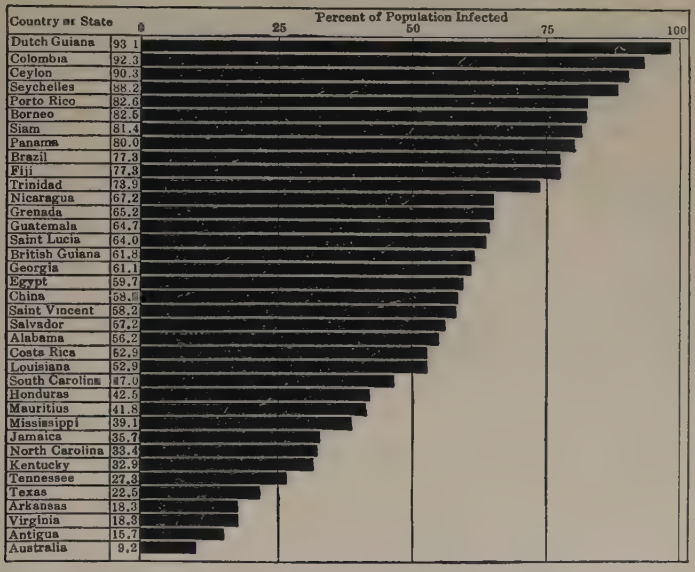
The Limited Distribution of African Sleeping Sickness.—The effect of geographical environment upon the distribution of a disease like sleeping sickness is more clearly defined, although no more real or important, than upon a widespread disease like tuberculosis. True sleeping sickness, as distinguished from what is often called by that name in America, is due to animal parasites or protozoa, called trypanosoma, which are carried to man by a kind of tsetse fly (glossina). The tsetse fly is limited to the tropical parts of Africa, and occurs only in small tracts always situated in forest, bush, or banana plantations, or among other shady vegetation. The one that causes sleeping sickness practically never flies outside a narrow bushy belt 30 to 100 feet wide along banks bounding open water. Even when carried by animals or men, it is rarely found more than a quarter of a mile from such banks. Hence sleeping sickness is very rarely contracted anywhere except in certain very limited parts of tropical Africa.

Reasons for the Distribution of Malaria.—Other parasitic diseases are intermediate between tuberculosis and sleeping sickness in their geographical distribution. Among these is malaria, one of the diseases which most seriously reduce man's productivity not only in tropical regions, but in many others. It prevails only where conditions are favorable for the breeding of mosquitoes of certain definite species, chiefly anopheles. These mosquitoes do not thrive in cold regions, and only a few species can live in running water. In tropical climates vast numbers breed in stagnant pools and in the damp hollows among the trees. In middle latitudes malaria is especially abundant in regions with the subtropical type of climate where the rain falls chiefly in winter and the summer is dry. In such a climate, during the dry season, stagnant pools usually abound along the water courses, and there are many other pools due to irrigation.

In many tropical regions the conditions are like those at Baoe-Baoe in the island of Celebes. Until 1922, when sanitary reforms were instituted, practically every European was frequently incapacitated by malaria. In the Dutch military encampment the brigades were often "only able to march by combining two brigades into one." Out of an average of 350 people in the civil infirmary and the prison, 20 died each month. The draining of swamps and the building of proper sewers,

gutters, privies, and the like promptly reduced the amount of malaria to one-fourth of its former level. Previous to this work, all the native children who were examined had enlarged spleens, and the adults were practically all anemic and inefficient as the result of repeated malarial infections, especially in childhood. Afterward only 13 per cent of the children had enlarged spleens, and even the older people worked with new cheerfulness and vigor.

Spain, Italy, Greece, Turkey, and China suffer terribly from malaria. Up to almost the end of the last century, from a quarter to a half, or even three-fourths, of the inhabitants in many parts of those countries



Courtesy of International Health Board of Rockefeller Foundation.

FIG. 33.—Hookworm Infection.

Based on surveys made by the International Health Board from 1910 to 1922.

were infected with the disease or had had it during childhood. Malaria is preeminently a disease which saps people's energy for a long time. It keeps recurring at intervals of months or years, even without a new infection. It has a special tendency to cause people to be mentally as well as physically inert. In tropical countries it is still worse, for there it often takes more virulent forms and is fatal in a short time.

Hookworm and the Effect of Preventive Measures on Efficiency.—Another disease of a similar baneful character is caused by the hookworm, which also is confined largely to fairly warm countries. The worm lives in the mud, and enters the body by attaching itself to the skin and boring

its way to the blood vessels. Naturally it has a chance to touch the human skin chiefly in places where people go barefooted. The extent to which such diseases reduce human productivity is astonishing. In Egypt half the laboring population is infected with hookworm, in the Malay states 60 per cent, British Honduras, 70 per cent; the Philippines, 15 to 75 per cent, according to locality; Sumatra and Java, as high as 90 per cent in some regions, and so on for almost all tropical countries. (Fig. 33.)

According to the estimates of the Rockefeller Sanitary Commission, about 940,000,000 of the 1,700,000,000 people of the world live in areas where hookworm disease is prevalent. Half the people within the tropics probably suffer from the disease at all times, and many others have it at some time during their lives. It stunts the growth of children, retards their mental development, and makes adults anemic and incompetent. In Costa Rica, 66 laborers before being treated for hookworm normally cultivated 563 acres of coffee monthly. After treatment they cultivated 750 acres. In India the amount of work increased 20 per cent on one estate and 50 per cent on another, and on both was of better quality than before the laborers were treated; reports from British Guiana indicate that the efficiency of the laborers employed by one company increased from 25 to 50 per cent after measures to eradicate the hookworm were put into operation.

Food, Clothing, Shelter, and Health.—The importance of food, clothing, and shelter as factors in human health is universally recognized. In the majority of communities the differences in these respects are among the most noticeable and important of social phenomena. The geographical distribution of all three is so closely tied up with climate, occupations, density of population, stage of culture and the like that we shall not attempt to discuss them separately. The vast majority of mankind, for example, eat the kinds of food that can best be produced in their immediate vicinity. Even in such highly developed communities as the manufacturing cities of the northern United States, the main staples of diet are potatoes, milk, eggs, vegetables, and fruits raised within a few hundred miles, and wheat and meat raised a thousand miles or so farther west. We are often impressed by the importance of imported articles of diet, but that is largely because of their agreeable taste rather than their value as food.

Occupations and Health.—Man's health and efficiency often vary from one region to another because of the prevalence of different occupations. One occupation leads to accidents, as in mining; another to parasitic diseases, as in stone cutting. In Iceland, because the environment forces the people to depend largely on fishing, the death rate from

accidents among young men is appalling. Normally the deaths among young men 15 to 24 years of age average about 95 for every 100 among young women of the same age. In Iceland, the risks due to fishing and to tending sheep in a region subject to fogs and other dangers raise the figure for young men to 169 as the average from 1876 to 1915. It is said that among the northern Eskimos one rarely sees an old man although there are many old women. The dangerous occupations kill the men young.

A good illustration of the effect of occupations, both directly and indirectly, upon the death rate is seen in the percentages by which the death rates at various ages in Pittsburgh exceed those in Philadelphia (Fig. 34). In early childhood the rate among both boys and girls is 30 to 40 per cent greater in Pittsburgh than in Philadelphia. In early manhood and womanhood this difference increases so that young women at the age of 20 to 24 are 50 per cent more likely to die in Pittsburgh than in Philadelphia, and young men over 80 per cent more likely. In other words, the average young man 20 to 24 years of age in Pittsburgh has nearly twice as great a probability of dying as has a corresponding young man in Philadelphia.

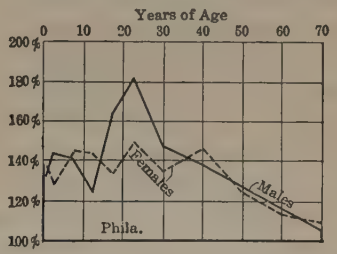


FIG. 34.—Death Rates at Pittsburgh Expressed as Percentages of Death Rates at Same Ages in Philadelphia, 1920.

This great difference cannot be due to climate, for, as nearly as can be determined by the methods described later, the climates of the two cities are almost identical in their effect on health. It cannot be due to differences in the proportion of foreign-born in Pittsburgh, for in 1920 the percentage for Pittsburgh was 20.4 against 21.8 in Philadelphia. Sanitation and medical service can scarcely be held accountable, for Pittsburgh is admirably drained, its sewage system finds an excellent outlet in the Ohio River, its death rate from typhoid fever is almost as negligible as that of Philadelphia, and in 1920 it had one physician per 588 people against one for 580 in Philadelphia. The outstanding factor which seems to be mainly responsible for Pittsburgh's high death rate and for the corresponding illnesses, weakness, inefficiency, and distress among many of its people, especially its young people, is the type of occupations and their effect on the air and on living conditions in general. Pittsburgh's main occupations not only are carried on in hot, dusty, unwholesome factories, but by filling the air with smoke they

hurt the health of everybody. Moreover, because they are disagreeable, they cause many of the more efficient and intelligent workmen to avoid Pittsburgh or move away at the first opportunity, unless tempted to remain by high wages.

Density of Population and the Distribution of Health.—From the geographical standpoint one of the most important facts is that under any given conditions of civilization a certain density of population forms the optimum for health. In regions of lower or higher densities people's health and efficiency decline. Take a stage of civilization like our own. If the population is very sparse, physicians and hospitals are beyond the reach of many people in an emergency. Moreover, education is usually backward, and people tend to neglect or be ignorant of the best sanitary practices. On the other hand, if the density increases beyond a certain point, the people begin to be packed into cities and to carry on some of the unhealthful occupations which we have been discussing.

Let us examine an actual example, namely, Pennsylvania and the parts of Ohio and Indiana directly west of it. We shall omit all counties bordering on the Great Lakes, because the lakes influence the climate, and we want to use an area where the climate is as nearly uniform as possible. That is why we employ a strip which is long from east to west and narrow from north to south. If we divide the counties and cities of this strip on the basis of the density of the rural population per square mile and the size of the cities, the death rates for the eleven years from 1910 to 1920 are as follows:

	Crude Death Rate	Adjusted * Death Rate
56 rural counties, density under 40	12.7	(12.0)
47 rural counties, density 40 to 50, *optimum*	*12.1*	(*11.4*)
30 rural counties, density 50 to 80	12.7	(12.2)
14 rural counties, density 80 to 120	13.1	(13.0)
9 rural counties, density over 120	13.7	(13.5)
39 cities, 10,000 to 20,000 population	14.6	(15.0)
26 cities, 20,000 to 30,000 population	15.6	(16.0)
27 cities, 30,000 to 300,000 population	14.8	(15.5)
3 cities, Philadelphia, Pittsburgh and Indianapolis	16.5	(17.0)

* The adjusted death rates make allowance for the fact that young people tend to go from the rural districts and small towns to the cities, especially the cities of medium size. The crude rates in the rural districts are higher than the adjusted rates because the rural districts contain a large proportion of children and old people among whom the death rate is high. In the cities the adjusted rate is the higher because of the presence of relatively few children and many young people. The adjusted figures are estimated on the basis of data for 1920 and 1921 for the states as a whole and for the cities of over 100,000 population. They are subject to revision, but give a truer picture than do the crude rates.

According to the adjusted figures, the most sparsely populated counties had a death rate of 12.0, whereas those with a somewhat denser population had the surprisingly low rate of 11.4. In the most sparsely populated districts the isolation of the people, the consequent lack of medical care, the prevalence of ignorance, and perhaps other disadvantages make people less healthy than where the rural population averages 40 to 50 per square mile. The low rate in all the rural regions is doubtless due mainly to the fact that the people are largely agricultural, or else live in villages, small towns, or suburbs, where the air is pure. Note the astonishing way in which the death rate rises as the population becomes denser and the cities larger. Only in the case of cities with a population of 30,000 to 300,000 is there a slight irregularity. This is due to cities such as Akron with a death rate of 10.9, Canton (12.1), Muncie (12.2), and a few others in Ohio where the rates are unusually low.

The outstanding feature of the whole matter is this: The advantages of the rural districts consist of (1) good air, (2) healthful occupations, and probably (3) better food than that of the poorer people of the cities, because of greater abundance of milk, fruit, and vegetables. The advantages of the regions with denser population and especially of the cities consist of (1) more numerous physicians, (2) far more elaborate and expensive systems of public health, (3) better education, and possibly (4) a population containing a large percentage of persons with an unusually good inheritance which was presumably one reason why they were ambitious and gravitated toward the city. It may be, however, that this advantage is offset by poorer physiques among immigrants. Whatever may be the truth in respect to the innate physique of the people, it is obvious that the bad air, congestion, unhealthful occupations, and other unfavorable conditions of the cities are by no means counterbalanced by all our efforts to promote health. The average person in the big cities in the region chosen for our example is 50 per cent more likely to suffer from disease than is the average person of the same age in the rural counties where the population has the optimum density of 40 or 50 per square mile. Similar conditions prevail all over the world. Although cities are a necessity, and are one of the chief means of progress, their unhealthfulness reduces human efficiency at a portentous rate.

Advancing Civilization and the Distribution of Disease.—The advance of civilization has two opposite effects upon health. First, by improving transportation and increasing migration it spreads diseases into new regions; second, by improvements in hygiene, sanitation, and medical practice it reduces the severity of diseases, and may eliminate

them from large areas. Yellow fever is a good example. It is of American origin, endemic originally in the West Indies and the northeastern coast of South America. After the discovery of America it was carried to the Old World, North America, and the southern parts of South America. One of the many epidemics carried off about 5000 persons in 1821 at Barcelona; another, nearly 6000 in a few weeks at Lisbon in

Courtesy of International Health Board of the Rockefeller Foundation.

FIG. 35.—Advance and Retreat of Yellow Fever.

1857; a third, some 8000 at New Orleans in 1853; and still another, 4000 at Rio Janeiro in 1850. In 1884 when the French tried to dig the Panama Canal, they lost 60 or 70 out of every thousand men each year through yellow fever alone.

The ultimate expansion of yellow fever in America is illustrated in the map for 1900 in Fig. 35. At that time the disease was a dangerous scourge wherever the stegomyia mosquito is able to live. By various means, but mainly in the damp holds of ships, especially the old sailing

ships, the stegomyia mosquito and the yellow fever bacilli were carried to all coast towns and to those of great rivers like the Amazon and lower Mississippi, wherever the climate was propitious. Fortunately, the mosquito is subject to strict climatic limits, for it can live only near water on lowlands in tropical or almost tropical regions. Yet, even so, the spread of the disease was portentous.

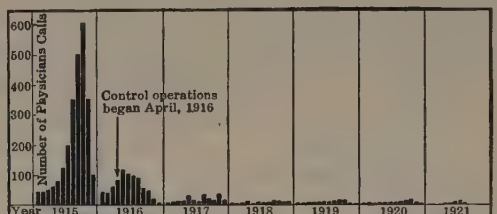
After civilization had done its utmost to spread yellow fever throughout the world, its remedial agencies were at last brought into action. The result is seen in the other three maps of Fig. 35. Apparently yellow fever will soon be exterminated, not by killing all stegomyia mosquitoes, but by isolating every person who has yellow fever so that no mosquito can get at him to imbibe bacteria to transmit to someone else.

A similar process of expansion and contraction through the agencies of civilization seems to be the fate of a vast number of diseases. Smallpox, for example, formerly killed tens of thousands of people even in highly progressive countries and left hundreds of thousands of others with faces permanently scarred and pitted. By means of vaccination it has now been practically eliminated in most of the United States and much of western Europe, but in unprogressive countries such as Turkey it is still as great a scourge as ever.

Increased Contrasts between Progressive and Backward Countries.—This illustrates an important principle which applies not only to the reduction of disease, but to practically every type of progress. The principle is that the growth of civilization tends to increase the contrast between progressive and backward countries. It tends to raise the backward countries only when the progressive people actually go to the backward ones and make improvements in spite of local hindrances and prejudices. A progressive country takes up a new idea and gets the benefit of it; an unprogressive country rarely does so. Thus the differences between the different parts of the world increase. For example, in all progressive countries the advance of civilization has reduced the death rate, the reduction amounting to fully a third in many of the most progressive countries. But even in a country like Hungary, the improvement has been slight, while in Central Africa, Persia, China, and many other backward regions there has been no known change.

The effect of civilization in altering the geographical distribution of health, and hence of human productivity and achievements, is most markedly shown where people of high culture introduce their own methods in backward regions. The introduction of up-to-date methods at Panama reduced the admissions of malarial cases to hospitals from 821 per thousand in 1906 to 76 per thousand in 1913. Similar reductions

have been made in hookworm, disease, yellow fever, and other tropical diseases. Fig. 36 illustrates how the introduction of modern sanitary methods in Arkansas speedily reduced malaria to negligible proportions. When we recall the great effect of disease upon efficiency, it is evident that modern medical practice ranks with natural selection, occupations,



Year	1915	1916	1917	1918	1919	1920	1921
Pop.	2000	2029	2200	2370	2540	2707	2850
Cost		$2,500	$1,280	$1,075	$2,000	$2,000	$5,350
Per Capita Cost		$1.23	$0.58	$0.45	$0.79	$0.74	$1.88

Courtesy of International Health Board of Rockefeller Foundation.

Fig. 36.—Control of Malaria in Arkansas.

climate, food, or any other factor in its effect upon health and productivity.

EXERCISES AND PROBLEMS

1. Make an estimate of the time lost through ill health in your class during the past year. Set a reasonable value on your own time and on that of the persons who take care of you during illness. On that basis estimate the cash value not only of the time lost by the class during actual illness but of the medical care, nursing, and inconvenience at home, and the loss due to inefficient work occasioned by ill health even when the members of the class are not ill enough to be kept at home. At the same rate per capita how much would poor health cost the entire United States each year? Remember that students are engaged in an uncommonly healthful occupation, they are in an exceptionally healthful period of life, and your estimates presumably take no account of the great financial losses due to death whereby valuable producers are removed and business is seriously deranged.

2. In Table 46 compare columns C and D. How far do they support the statements in the text as to the unhealthfulness of cities? Plot the data of column E on an outline map. In what kinds of regions is the difference between the death rates in great cities and elsewhere large or small? What relation can you detect between your answer to the last question and (*a*) the prevalent occupations outside the big cities in various parts of the country; and (*b*) the number of people in small cities? What factors co-operate to make Utah and Washington exceptional in column E? Are they the same factors which give Rhode Island and Connecticut almost the same death rate in the cities of over 100,000 population as in the other parts of the state? Look up the number of cities in these various states aside from the big cities, and examine the percentages of urban population (Table 2, columns E and F).

3. Procure several reports of the International Health Board of the Rockefeller

oundation, and let different members of the class report on what they show as to the eographical relationships of disease and efficiency.

4. In the volumes entitled *Mortality Statistics* published annually by the U. S. ensus study all available data as to the death rate for a series of years in your own ounty, town, and city. How great are the fluctuations from year to year? How oes your region compare with similar regions elsewhere? What effect is produced n your region by (*a*) the adjustment of rates to fit the age distribution of the popula- on and (*b*) the refinement of rates to allow for the deaths of persons away from neir own homes?

5. In Table 47 classify the cities into (A) four equal groups based on temperature n July, (B) four similar groups based on temperature in January, and (C) four roups based on rainfall. Ascertain the average death rate for each group. Draw onclusions as to the relative importance of summer temperature, winter tempera- ure, and rainfall in determining conditions of health.

6. In Table 47 pick out ten or twelve pairs of cities located close together but iffering considerably in death rates. Study the size, occupations, illiteracy, and acial composition of the cities with low versus high rates.

CHAPTER IX

WEATHER, CLIMATE, HEALTH, AND PROGRESS

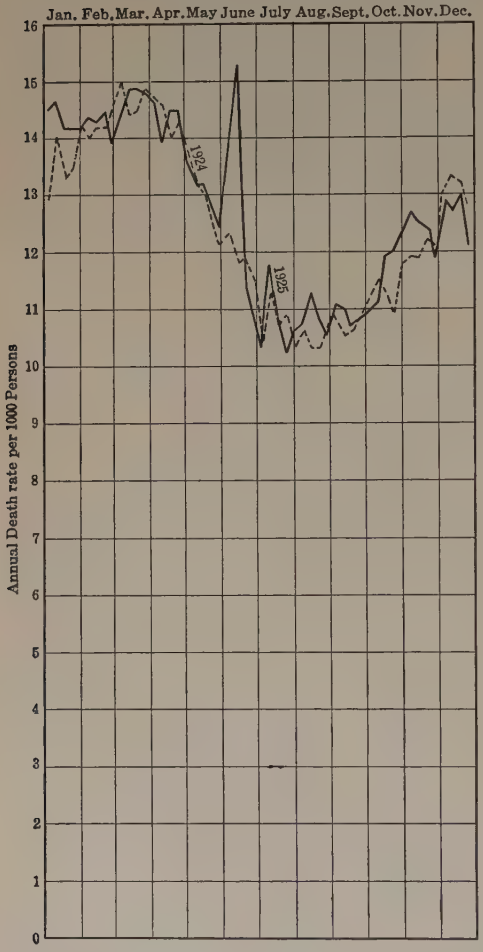


FIG. 37.—Effect of Weather and Seasons on Death Rate in 63 Largest Cities of the United States, 1924 and 1925.

Note the effect of a hot spell in June, 1925.

The Weather and Health.—In the preceding chapter we examined the part played by six important factors in determining the geographical distribution of health and efficiency, and thus of activity in business. Here we shall consider a seventh factor—weather and climate. The effect of the weather is well illustrated in Fig. 37. The dotted line represents the death rate in the sixty-six largest cities of the United States from week to week during 1924, and the solid line during 1925. Note the following features: (1) The general tendency of both curves to be high in winter, especially the late winter, and low in summer; (2) The many minor fluctuations; and (3) an extraordinary increase in the death rate in early June, 1925, and a smaller increase a few weeks later. All of these features are due mainly to the weather. In the case of No. 3 this is especially clear. In early June, 1925, almost the entire

United States suffered from an extraordinary hot spell which broke many records and was accompanied by great discomfort, inefficiency, illness, and death. Both among children and older people, many persons were so weakened that disorders which might otherwise have done no appreciable harm proved fatal. A few weeks later a similar hot spell, equally severe, but limited to an area in the south central interior containing only a few large cities, produced similar results on a smaller scale.

In these two hot spells, and likewise in the other fluctuations shown in Fig. 37, epidemics played no special part. But the effect of the weather upon epidemics appears to be about the same as upon other types of disease. For example, during the great influenza epidemic of 1918 the death rate varied from city to city in fairly close harmony with the temperature before the onset of the disease and at its crisis. If the weather was cool and invigorating, but not cold, the ravages of the disease were reduced. The death rates during the first ten weeks of the main epidemic in the thirty-six cities of over 100,000 inhabitants for which data are available were as follows:

	Mean Temperature for 30 Days before Outbreak of Epidemic and for 10 Days at Crisis	Death Rate per Thousand from Influenza and Pneumonia
6 coolest cities	54°	2.6
6 next coolest cities	57½°	3.0
6 next coolest cities	61°	3.5
6 next coolest cities	63°	4.2
6 next coolest cities	65°	5.0
6 warmest cities	70°	5.2

No other known factor, not even the sanitary and medical conditions of the various cities, shows any such close relationship to the death rate. This does not mean that the weather caused the epidemic; there is no evidence of that. It merely increased or diminished its severity.

Effect of the Seasons on Health and Energy.—Fig. 38 gives another example of the effect of the weather not only on health but upon energy in general. The lower curves show the death rate in Connecticut (*C*) in Pennsylvania (*D*) from 1910 to 1913, among persons more than two years of age. The curves are inverted so that good health is indicated by high parts and poor health by depressions. The two upper curves show the average hourly earnings of piece workers in three Connecticut

factories (*A*) and in a huge Pittsburgh factory (*B*) during the same period. Notice how nearly the four curves vary in harmony. In January, 1910, people's energy fell off very badly, as appears in curves *A* and *B*. At the same time many became ill so that during the next two months the death rate was very high, as indicated by the low level of curves *C* and *D*. During the spring of 1910 both health and energy increased rapidly and reached a high point in May and June. When the summer heat came on, it was great enough to diminish the energy of the factory workers materially so that curves *A* and *B* show a sag. Ill health also increased somewhat so that curves *C* and *D* become flat and

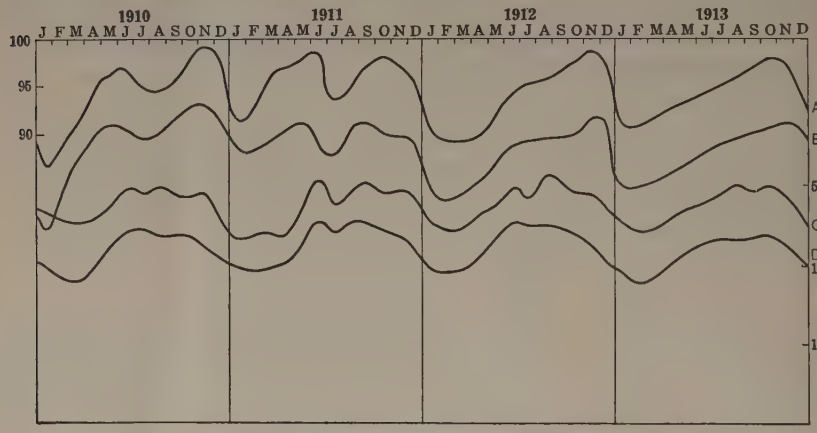


FIG. 38.—Seasonal Variations in Health and Energy in Connecticut and Pennsylvania.

Work of factory operatives in (*A*) Connecticut and (*B*) Pennsylvania; health (death rate inverted) in (*C*) Connecticut and (*D*) Pennsylvania. Scale for (*A*) on left and (*C*) on right, (*B*) and (*D*) are placed below the others for convenience, although really belonging at essentially the same level.

sag a little, but not seriously. If children under two years were included, the health of this and of other summers would appear worse than in Fig. 38.

Follow the curves through the four years. Without exception they are low each winter. In the summer of 1911, which was extremely hot and trying, especially in New England, they all show a dip, while in the summers of 1912, and especially 1913, when the hot spells were short and well separated, the heat had almost no effect. In the late autumn the curves for health drop sooner than those for energy, which seems to mean that the approach of cold weather at first stimulates people who are in good health while those who are feeble feel an ill effect from the low temperature more promptly. In winter, however, a drop in energy is regularly followed by a long period of poor health.

The four curves fluctuate so closely together that they seem to be subject to the same influences. The four factories were engaged in different kinds of work; there were no strikes, labor troubles, or shutdowns to cause fluctuations in any of them; and the cities of Connecticut are 400 miles from Pittsburgh. There were no epidemics of any importance to cause the curves of health to go up and down together, and the agreement would be equally great if all contagious diseases were omitted. The only factor which seems competent to explain the curves and which varies in approximately, though not exactly, the same way in both places is the seasons and the general character of the weather. Records of deaths and factory work in more southerly states including the Carolinas, Georgia, and Florida show that the winter in the South is less harmful than in the North, while the long, hot summers have a correspondingly bad effect upon both health and energy. Tens of millions of deaths in all countries where reliable records are available, and much evidence as to rates of work suggest that seasonal rhythms of health and efficiency corresponding to those of climate are universal. They prevail on a mild scale even in tropical countries. In India and Mexico, for example, the wet season brings a decline in the death rate and an increase in physical activity.

Many other conditions, such as the growth of children, the mental activity of students, and the occurrence of mental diseases, show pronounced seasonal fluctuations which appear to depend mainly on the weather. These human rhythms are closely similar to those of animals and plants. That they are due to climatic causes and not to some innate quality of the organisms is generally inferred from the fact that they vary with the weather, not only from one year to another, but from place to place. In the southern hemisphere, for example, the physiological conditions of July are the same as those during January in corresponding climatic regions of the northern hemisphere. When people change their climate, they also change their seasonal physiological rhythms. This has been observed again and again among animals and plants as well as people.

Effect of Minor Variations of the Weather.—Let us next consider the relation of the weather to individual climatic factors, beginning with temperature. Figure 39 sums up an investigation of the deaths during sixteen years (1900–1915) in thirty-three large cities of the United States—all the cities for which data are available. It shows the amount by which the death rate in any given month when the weather conditions were above normal exceeded or fell short of the rate during corresponding months below normal. Thus in the upper section the dark shading at the left means that during the eight Januaries when the tem-

perature was unusually high, the death rate was relatively low, lower than in the eight when the temperature was below normal. In February and March a similar relation prevailed. In April, however, people's health was practically the same during the eight years when that month was warm and the eight when it was cool. From May to September, on the contrary, the number of deaths was large in years when the thermometer stood above normal and low in years when those months were cool. During the balance of the year, on the contrary, relatively high temperature was accompanied by few deaths, as in January to March. The important point about all this is the uniformity with which any extensive departure of the temperature above or below a certain level has a harmful effect upon health.

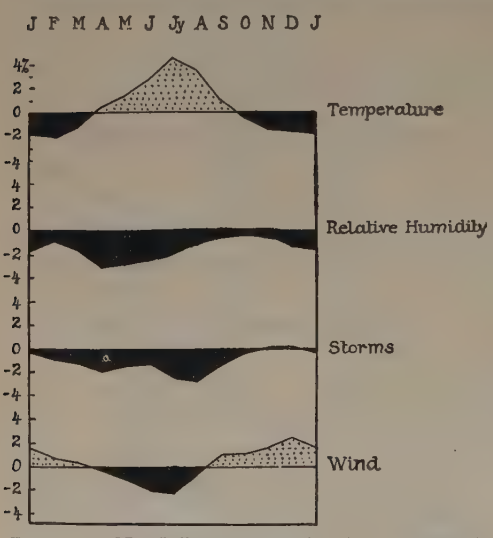


Fig. 39.—Net Effect of Weather in the United States.

In the second section of Fig. 39 the heavy shading during every month indicates that on the whole the moister months are more healthful than the drier months at all seasons. This is especially marked in the driest parts of the country, as at Denver and Spokane, whereas at coastal cities like New York the moister summers have a higher death rate than the relatively dry ones.

The third diagram indicates that storms are beneficial. Except in the autumn the stormier eight Januaries, Februaries, and so forth during our sixteen-year period had an average death rate lower than that of the corresponding months with fewer storms. Here again, individual cities show different results according to where they are located. Baltimore, Washington, Nashville, and Memphis apparently do not have enough storms, and hence are especially benefited when the vagaries of the seasons bring unusually stormy weather. More northerly and stormy cities, however, experience this benefit mainly in summer, and only rarely in winter. Many other lines of evidence suggest that the variability of the weather due to storms is stimulating, and that such variability, like temperature and moisture, has a certain optimum above or below which the effect is less favorable. For example, in New York

City a study of the deaths day by day for many years shows that at all seasons, summer and winter alike, a *drop* in temperature is systematically accompanied by a drop in the death rate, and a rise of temperature by a corresponding increase in deaths. This occurs regardless of the fact that *continued* low temperature is accompanied by a high death rate, as is continued high temperature. The drop in itself appears to be what counts. The harmful effect of rising temperature does not quite equal the helpful effect of falling temperature. Thus the net result of variable temperature or of the other variations which accompany changes in temperature is stimulating. That is presumably the reason why storms appear beneficial in Fig. 39.

The lower diagram of Fig. 39 suggests that strong winds are harmful to health in winter and beneficial in summer. This may be due to the wind itself, but more probably to the temperature, moisture, and other conditions which the winds bring with them.

The Optimum Temperature for Man.—The next step is to determine the optimum temperature, atmospheric humidity, and variability, and to discover how much harm results from departure from the optimum. Fig. 40 illustrates the effect of temperature alone, without respect to other conditions or to the season at which a given temperature occurs. The upper curve shows what happened to a large group of students at West Point and Annapolis. When the outside temperature was low, their marks in mathematics and English were also relatively low, which means that their minds were comparatively inactive. When the average temperature rose well above 20° F., the marks began to improve. When the outdoor temperature averaged about 40°, that is, when it rose to perhaps 50° by day, and there were light frosts at night, mentality seemed to be at its best. At higher temperatures the minds of the students were less alert in spite of the fact that the approach of examinations demands special exertion in the spring and early summer. Much further study is needed before the exact facts as to the relation of mental activity and the weather can be stated positively, but enough is known to indicate that there is an important relationship, and to suggest that for some unknown reason the conditions which accompany fairly low temperatures are more stimulating to mental than to physical activity.

The second curve in Fig. 40 shows variations in health at different temperatures as determined by an analysis of millions of deaths and thousands of illnesses in many countries. Here, just as in the mental curve, people's health and energy appear to be relatively low in cold weather. When it is cold, people may be active, but they do not have much surplus energy; if they become ill, they are in much more danger of dying than in warmer weather. As the temperature rises, health and

energy keep on improving until the highest level is reached at an average of about 64° F. for day and night, that is, when the thermometer rises to 70° more or less at midday and falls below 60° at night. The work of factory operatives shows an almost similar curve, except that it reaches its highest level at 60° instead of 64°. Accurate experiments, especially at the laboratory of the United States Bureau of Mines in Pittsburgh, likewise place the optimum temperature for physical comfort between 60° and 70°, the exact position depending upon the humidity, just as is the case with deaths and factory work. Thus, for the white race the optimum temperature at ordinary humidities, say 50 to 80 per cent, lies not far from an average of 64° for day and night.

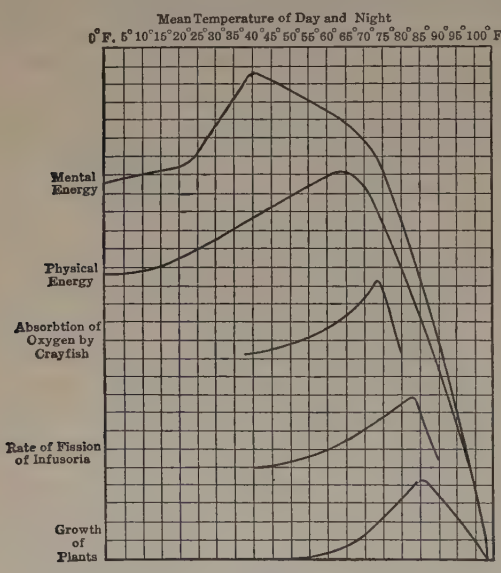
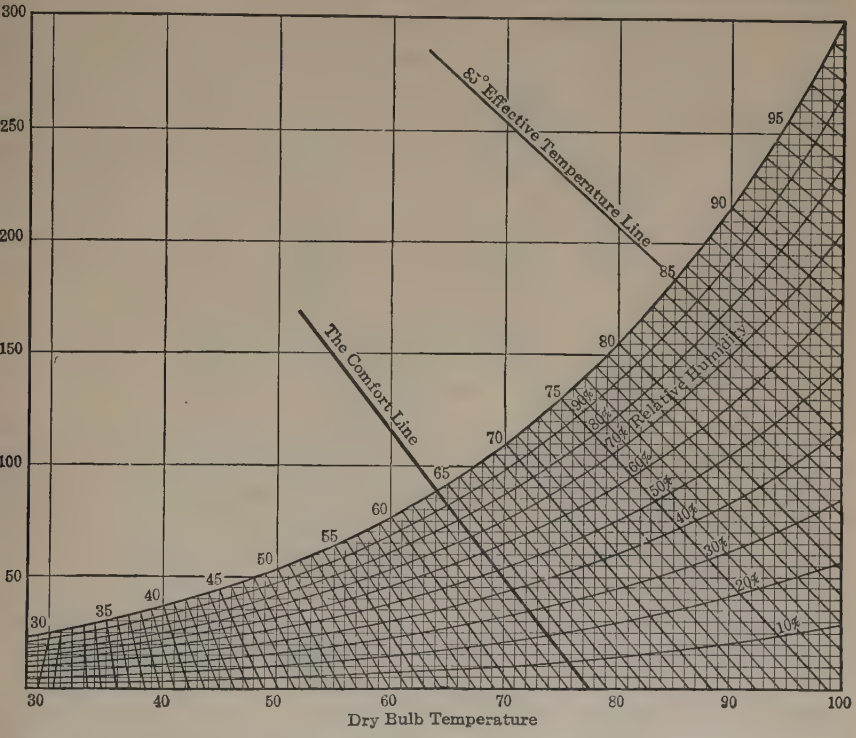

Mean Temperature of Day and Night
0° F. 5° 10° 15° 20° 25° 30° 35° 40° 45° 50° 55° 60° 65° 70° 75° 80° 85° 90° 95° 100° F.
Mental Energy
Physical Energy
Absorbtion of Oxygen by Crayfish
Rate of Fission of Infusoria
Growth of Plants

FIG. 40.—Relation of Temperature to Vital Processes.

The other curves in Fig. 40 suggest that man is much like other forms of life. One shows the amount of carbon dioxide liberated by the crayfish at different temperatures. This is a measure of the animal's activity. At temperatures a little above freezing the life processes of this cold-blooded animal practically cease. With warmer conditions its activity rises steadily to a maximum not far from 75° and then falls off rapidly. In the much lower form of life shown by the infusoria curve, the rate at which the cells divide varies in the same way as the activity of the crayfish, except that the optimum is a little higher. The same is true of plants, whose optimum in most cases is highest of all. Fig. 40 illustrates the fact that among all living beings the same great law of optimum temperature apparently prevails.

The Effect of Atmospheric Moisture.—Among the climatic elements other than temperature, people often suppose that the barometric pressure is highly important; but except at high altitudes it is now generally agreed to be important chiefly because of its effect upon variations in temperature and humidity.

It is hard to separate the effects of humidity from those of temperature. In general, the investigations thus far made suggest that people work best with high humidity in winter, and low humidity in summer. An investigation of nearly ten million deaths in the United States, France, and Italy indicates a mean temperature of 64° F., and a mean relative humidity of 80 per cent as the optimum when day and night are both considered. The whole matter is summed up in another



Courtesy of American Society of Heating and Ventilating Engineers, and U. S. Bureau of Mines.

FIG. 41.—Comfort Chart, Showing Relation of Atmospheric Temperature and Humidity to Human Comfort in Still Air when People Are Absolutely at Rest.

way in Fig. 41. Temperature is there measured horizontally, from low on the left to high on the right. The amount of moisture in the air is measured vertically, the bottom of the diagram representing absolutely dry air, and the top a condition where the air contains several hundred grains of moisture per pound of air. The curved lines show relative humidity. As the result of experiments carried on by the American Society of Heating and Ventilating Engineers and the United States Public Health Service in the Laboratory of the Bureau of Mines at Pitts-

burgh, it has been found that when people are absolutely at rest and the air is motionless, the most comfortable conditions are those indicated by the heavy line sloping downward from left to right. Along each of the other lines parallel to this, the atmospheric conditions are at all points equally comfortable, whereas the degree of comfort diminishes as one recedes from the comfort line. The comfort line passes through approximately the following points:

A. Temperature, Degrees F.	B. Relative Humidity, Per Cent	A Temperature, Degrees F.	B. Relative Humidity, Per Cent
64	100	71	40
65	90	72	30
66	80	74	20
67	70	76	10
68	60	79	0
69½	50		

In other words, if the temperature is 66° and the air holds 80 per cent as much moisture as it possibly can, a condition common in cool greenhouses, the kind that have a spring-like freshness, one feels as comfortable as in a temperature of 74° and a relative humidity of only 20 per cent, a condition common in houses and offices in cold weather. If the air is in motion, which is rarely the case within doors in winter, a temperature somewhat higher than that of the comfort line is the optimum for comfort. If people are in motion, as they generally are to at least a slight extent, the reverse is the case. Even a little movement warms people's bodies and thus lowers the position of the comfort line. Other experiments, such as those of the New York State Ventilation Commission, indicate that although for a short time people may feel as comfortable at 75° F. as at 68°, their bodies are subject to a greater strain in the warm air than in the cool.

All these various lines of evidence are in close agreement. An average temperature of 64° and an average relative humidity of 80 per cent for day and night together mean a daytime condition of perhaps 66° to 70° with a relative humidity of 50 to 70 per cent, which corresponds almost exactly with the findings illustrated in Fig. 40. At night, on the other hand, a temperature not far from 60° with sufficient moisture to produce dew on the cool ground is best. Such conditions appear to be the ideal toward which we ought to strive within our houses, schools,

and places of business. Failure to do this is apparently an important reason why health and efficiency fall off so badly in winter even though we protect ourselves from the outside air by means of heated houses. Within our houses the winter air is often extraordinarily dry. This not only parches the mucous membrane and leads to colds, but makes people sensitive to drafts. In the autumn we sit in a temperature of 65° and feel comfortable. As soon as the rooms are heated, however, many people feel chilly if the thermometer falls below 70°. The extreme dryness causes rapid evaporation from the skin and that makes us cool even though the temperature is higher than is good for health. If people would live in cool and properly humidified but not damp rooms, not only would they probably soon find themselves comfortable but their health, work, and pocketbooks would presumably be better off.

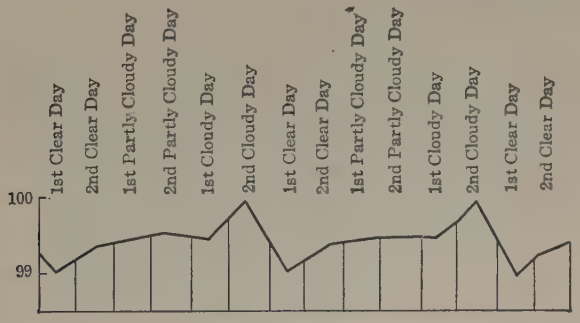


FIG. 42.—Effect of Changes of Weather.

The Benefit of Variability.—The importance of variable weather in other respects, as well as health, is illustrated by two sentences from the sporting page of a morning paper: "With a marked change in the weather the men of the university football team showed more spirit than they have displayed all the week." "A touch of winter in the air made the football practice a little snappier this afternoon." The two reporters who wrote these words touched on something which we all know, but whose importance is perhaps greater than we realize. When to-day's temperature is the same as yesterday's, people tend to work slowly, while if there is a change they work faster. Of course, the change may be too extreme, but that occurs only occasionally. In three Connecticut factories a rise in temperature, taking the year as a whole, was slightly stimulative, while a drop of from 4 to 10 degrees caused people to work faster than at any other time. This means that each of the storms which pass over us probably gives a distinct impetus and makes us work faster. Fig. 42 shows the average effect of clear and cloudy

days on 300 factory operatives during a year in Connecticut, regardless of temperature. Most people think that they work fastest on a bright, clear day after a storm, but these hundreds of factory operatives did not do so. The people whose work is illustrated in Fig. 42 worked most slowly on the first clear day. Their work increased a trifle on the next clear day, and on the partly cloudy days, and was highest at the end of a storm. The first cloudy day was not favorable, but the second cloudy day when rain perhaps fell in the morning, the sky began to clear in the afternoon, and a brisk northwest wind brought lower temperature was the time when they were most efficient. Fig. 42 suggests that the passage of each successive storm spurs people to greater activity.

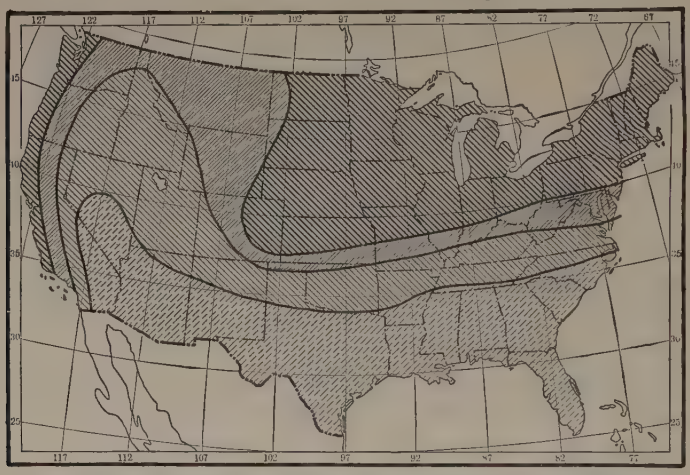


Fig. 43.—Distribution of Climatic Energy in the United States.

The Distribution of Climatic Energy.—The preceding facts enable us to construct a map of climatic energy, that is, the degree of health and energy that would be expected in any given region if all other conditions were uniform, and climate alone varied from place to place. Such a map, Fig. 43, shows that the best part of the United States is the northeastern quarter, especially the region from southern New England to Iowa. Although the winters are too cold and the summers often too hot, these disadvantages are partly neutralized by the constant succession of storms which give a stimulating variability and bring at least occasional days that more or less approach the optimum at almost all seasons. The Pacific Coast is also highly favorable. So far as temperature and relative humidity are concerned, its coastal sections are almost ideal, for days averaging below 40° and above 70° are almost unknown, and the atmospheric humidity is relatively favorable. The

main disadvantage is the infrequency of storms, lack of variability, although contrasts from day to night help in this respect. As for the rest of the map, notice how climatic energy declines in the southern United States. Note also the area of somewhat low energy extending toward Nevada, and the relatively low band covering the whole Rocky Mountain area. This does not mean that the climate in any part of the United States is really bad, for compared with vast areas in lower latitudes and even with most areas in similar latitudes almost all parts of the country are highly favored.

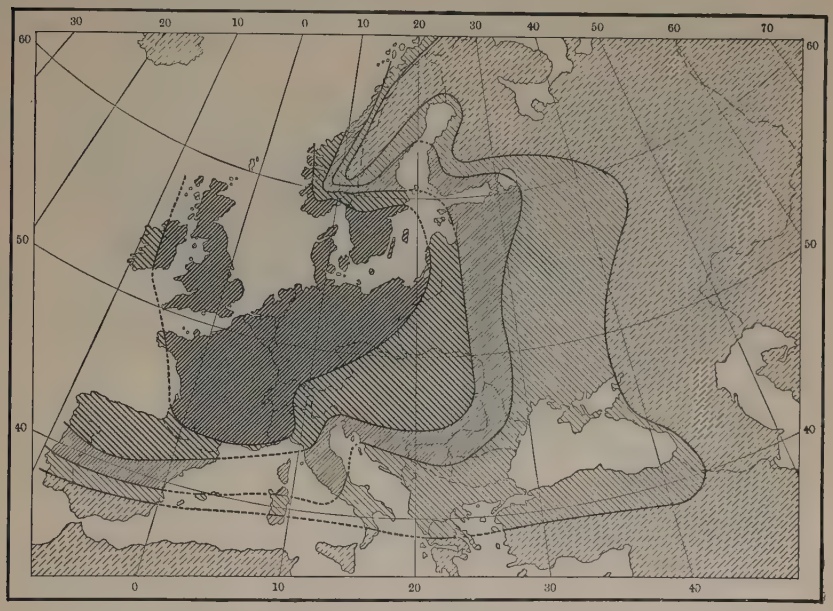


FIG. 44.—Distribution of Climatic Energy in Europe.

Depth of shading indicates the degree to which the climate makes people energetic.

A similar map of climatic energy in Europe appears in Fig. 44. Here the main features are the area of high energy around the North Sea, the decline from there outward in all directions, and the three tongues of relatively good conditions projecting toward the Baltic, Black, and Adriatic Seas. It is particularly noteworthy that the climatic energy of Europe declines from west to east almost as rapidly as from the North Sea southward.

Climatic Energy, Health, and Progress.—We have already seen that in Europe the maps of health (Fig. 31) and progress (Fig. 32) are practically identical. In the United States the same is true. Fig. 45 illus-

trates the opinion of twenty-three leading American geographers, ethnologists, and others as to the relative rank of the states in all kinds of progress. It is based upon the definition of civilization already given. A corresponding map of health might be based on the official mortality record of the United States; but for large areas no records are available, and elsewhere the statistics are still doubtful. Again, the distribution of health in the United States is greatly influenced by the high mortality of the Negroes in the South and of the immigrants in the northeastern cities, by the low mortality of the selected and vigorous immigrants in the West, and by the contrast between the dense and unhealthy industrial population in some places and the healthy farm population else-

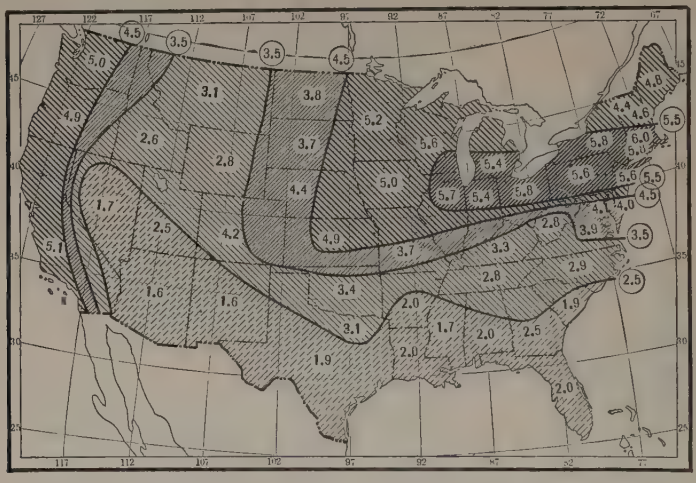


Fig. 45.—Distribution of General Progress in the United States.

where. Since we are here studying health in relation to climate, we ought to eliminate these factors as far as possible by using a map showing how the health of people of the same race and social condition varies from place to place. The best available approach to this is a map (Fig. 46) based on the statistics of life insurance companies. When the map was prepared, each of the three companies whose data are employed insured about the same kind of people in all parts of the country, so that the deaths, compared with the "risks," or people who are insured, give a good measure of the general conditions of health. The map shows that the best health is in the northeastern quarter or more of the country and on the Pacific Coast. The prairie states of Nebraska and Iowa stand highest. Much of their advantage is due to the large proportion of prosperous farmers among their risks. Southward there is a rapid

decline in health so that the death rate in the southern tier of states is 30 to 50 per cent higher than in those of the North. A noteworthy feature is an area of poor health running north into Nevada, and a band of relatively poor health across the entire Rocky Mountain area.

The most significant feature of this investigation of health is that our three maps of the United States are practically alike, and so are the three of Europe. In other words, *generalized* maps of climate, health, and progress in both continents present the same aspect. The word "generalized" needs emphasis. If we were to make maps showing every minute detail of either climatic energy, health, or progress, they would be extremely intricate and almost impossible to interpret and compare.

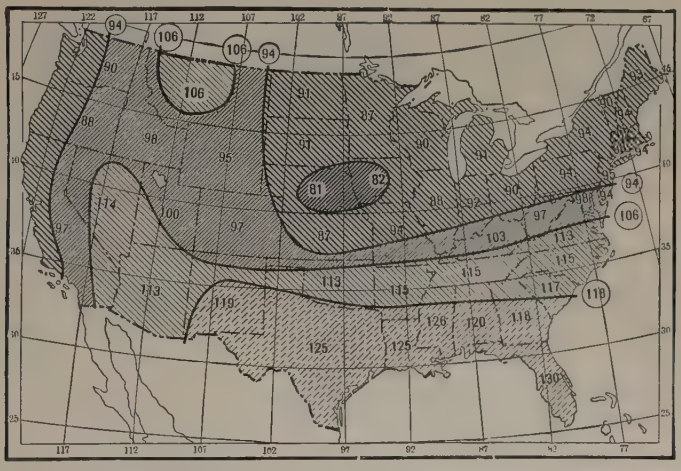


Fig. 46.—Distribution of Health in the United States According to Life Insurance Statistics.

Climate varies from hill to valley, from the lakes to the broad prairies, from the seacoast with its iodine in the air to the interior, and even from the hot city streets with their dust to the open country with its breezes and pure air. In the same way the health, energy, and efficiency of different families and different quarters of the same city vary enormously for all sorts of reasons; and so does the distribution of progress and civilization. The worst streets in New York or Chicago are in some respects more backward than many parts of Africa. Nevertheless, when we take the *average* conditions of climate, health, and progress in reasonably large areas this multitude of little differences disappears, and we see that in a broad way the distribution of the three conditions is similar.

World Relationships of Climate, Health, and Productivity.—Let us carry the matter one step further. Figs. 47 and 48 are world maps of climatic energy and civilization like the corresponding maps of Europe and the United States. They resemble one another closely, and are also much like the map of productivity, Fig. 2. Certain details are of course different. Where there are differences, these arise largely from the length of time that a region has been settled and from recent movements of Europeans. Perhaps the most surprising thing about Fig. 47 is the way in which climatic energy declines from western Europe through Russia to Central Asia. It was long supposed that, other things being equal, the climate would permit a man to be as capable

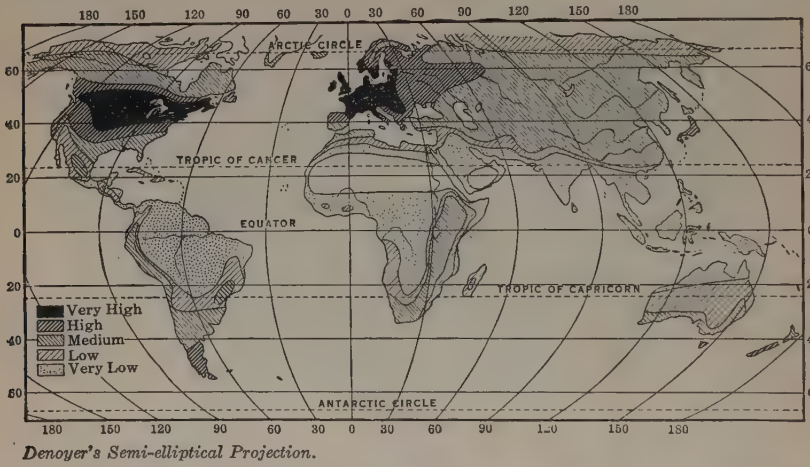


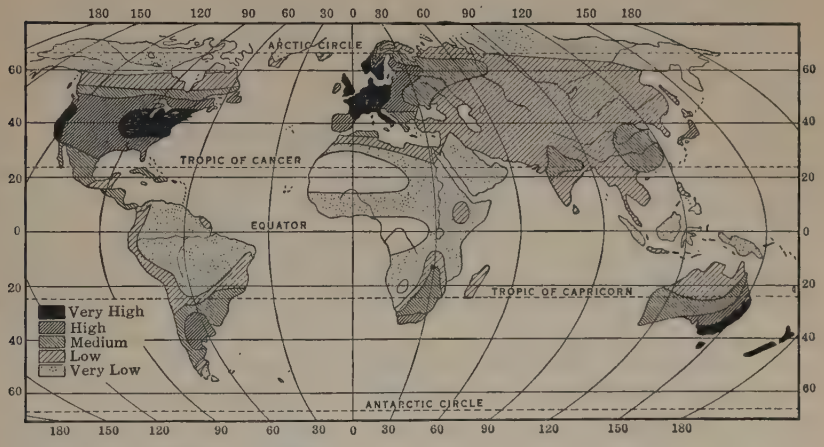
FIG. 47.—World Map of Climatic Energy on the Basis of Work in Factories.

in Central Asia as in Germany, but the climatic map suggests that this is not the case. From this point of view it is not surprising that the civilization of Central Asia is low. Farther East, on the other hand, climatic energy rises once more. It is comparatively high in Japan, and there we find the most progressive nation of Asia.

The general similarity in the distribution of climatic energy, health, productivity, and civilization is far too close to be accidental. Neither health, productivity, nor civilization has any appreciable effect upon climate, although each has an important effect upon the other. Therefore the climatic conditions must be the main foundation which causes the others to conform to its distribution. A given race with a given stage of civilization tends to be progressive and productive in fairly close harmony with the degree to which the climate helps it to ward off disease and to remain vigorous. This does not minimize the importance

of the many other factors which influence health and the distribution of human productivity and civilization. It merely means that climate establishes the broad lines of distribution, whereas other factors determine in large measure the more local contrasts.

The White Race in the Tropics.—The importance of tropical countries as the greatest undeveloped source of new production, water power, and the like, makes it peculiarly important to understand the true relation of such regions to the health of white people. Modern medicine and sanitation can overcome many of the unfavorable conditions of tropical countries, but whether they can do so entirely is doubtful. Panama is often cited as an example of the complete conquest of the



Denoyer's Semi-elliptical Projection.

FIG. 48.—World Map of Civilization

handicaps of a tropical climate. The facts do not sustain any such conclusion. Among the mixed population of the cities of Colon and Panama, the death rate was cut from 50 or 60 to 25 or 30 by the splendid work of the United States Army. Since then the rate has been falling no faster proportionally than in the United States, and perhaps not so fast. It still remains twice as high as in corresponding cities in this country. In any backward region the introduction of modern methods makes a tremendous difference at first, but thereafter the death rate still remains high almost invariably, and falls only at a rate corresponding to that in more favored regions. But how about such figures as the following, which show the death rates among white men in other regions compared with the rate among white employees of the same age in the Canal Zone? All the rates have been adjusted to a so-called standard population

so that the effect of differences in age is eliminated. Do they not prove that science may make tropical regions as healthful as any in the world?

	Death Rate from All Causes	Approximate Death Rate When Deaths Due to Violence Are Eliminated
New York State, 1906–1915	12.3	10.6
Connecticut, 1906–1915	10.8	9.3
Washington State, 1908–1913	7.8	5.3
New Zealand, 1906–1915	6.7	4.8
White Canal employees from the United States, 1912–1917	4.9	2.7
Students in Yale University, 1912–1917	1.9	1.7

These figures merely indicate that the effect of climate may be completely masked by natural selection, occupations, and the like. New York State, being handicapped by huge cities, unhealthful occupations, and immigrants untrained in sanitation, has a high death rate. Connecticut, perhaps because its cities are smaller, has a somewhat lower death rate, but is by no means so well off as the state of Washington, where a good climate, favorable natural selection, and healthful industries combine to promote good health. The immigrants to remote New Zealand have probably been even more highly selected than those of Washington, and the cities are smaller and the occupations more favorable. The white people employed at Panama are far more rigidly selected than those in New Zealand and Washington, and their occupations are very healthful. Persons who are organically diseased rarely attempt to go there. They cannot get employment, for the Canal employees are subjected to strict physical examinations. Moreover, while employed at the Canal they receive unusually good and systematic medical care, and many are sent home because they do not stand the climate. The data as to Yale University are added to show how selection may reduce the death rate in the United States as well as the tropics. Young men who are sick rarely enter a university. If they become sick while there, they usually go home. Hence the Yale death rate is only 1.9, whereas that of all young men of the same ages in the state of Connecticut is 4.5. It appears then, that while the reduction of the death rate at Panama is a wonderful feat, the low rate among white employees in the Canal Zone does not prove that the handicaps of the tropical climate have been eliminated.

Tropical Australia shows the same thing more clearly. We have already seen that the death rate in Queensland is extraordinarily low and the birth rate high. We have concluded that this is due largely to the selected character of the population. But what happens to the people born in Queensland? One answer is contained in the following table where the people who were *born* in Queensland—not those who have *gone* there as settlers—have the highest death rate in each of the six columns.

DEATH RATES PER "STANDARD POPULATION" AT AGE 15–49 YEARS IN VICTORIA, NEW SOUTH WALES, AND QUEENSLAND, ACCORDING TO PLACES OF BIRTH AND RESIDENCE, 1920, 1921, 1922

Birthplace	Residence					
	Victoria		New South Wales		Queensland	
	Male	Female	Male	Female	Male	Female
Victoria	4.38	4.01	3.60	3.38	4.28	3.72
England	3.65	3.87	3.78	3.39	4.66	3.99
Scotland	4.83	4.13	3.94	3.48	4.85	3.47
New South Wales	4.47	4.27	3.76	3.57	4.84	4.03
Queensland	5.22*	5.01*	4.42*	4.13*	4.87*	4.27*

* Maximum.

Another answer is found in the following figures showing the number of children born to persons whose own birthplace was in various regions and who died in Australia during the year 1921:

Germany	6.3	Tasmania	5.0
Ireland	5.8	South Australia	4.5
Scotland	5.7	Victoria	4.1
England	5.4	Queensland	3.8
New South Wales	5.1		

No matter in which state of Australia they live, the people who were born in Queensland have a higher death rate and a lower birth rate than those born in the other Australian states or in England or Scotland. The great majority of those who *reside* in Queensland, especially the tropical parts, have the advantage of having been born elsewhere. But those who are *born* in Queensland are not so strong as the rest of the population in spite of the fact that as a rule they live under similar conditions and had parents who presumably possessed unusual vigor. Thus it appears that even in the most favorable experiment of white residence

within the tropics, the white race suffers some loss of health and vigor even when tropical diseases are eliminated and other factors are favorable.

Changes of Climate and Civilization.—In weighing the relative importance of climate as a factor in determining the distribution of civilization and productivity, the past must not be overlooked. Mesopotamia, Syria, Egypt, Carthage, and Guatemala all produced great civilizations where climatic energy is now low. Some people believe that this proves that a stimulating climate is not essential to the highest civilization. A sound conclusion is possible only if we know the facts as to the climate of the past. Recent years have seen a hot debate over the question of climatic changes during historic times. Various hypotheses, such as those of climatic change due to deforestation, a steadily progressive change, and climatic uniformity, have all been advocated and rejected, as has the idea that climatic changes have been of the same kind in all parts of the world. The hypothesis which is now most widely accepted is that of pulsatory changes whose nature varies in different parts of the world. In other words, during some centuries and in some regions the climate has apparently been appreciably more stormy than now; at other times and in other places less stormy. The strongest evidence of this is found in (1) the distribution of ruins in dry regions; (2) the strands, fluctuations and salinity of enclosed lakes; (3) historical records of famines, storms, and the like; and especially (4) fluctuations in the rate of growth of old trees such as the huge sequoias of California, some of which are 3000 years old.

Few authorities now doubt that during historic times there have been climatic pulsations of longer duration and greater magnitude than those observed since records have been kept. The unsolved question is how great these pulsations have been, and how much effect they have had upon history. We can, however, gain some idea of how great a change in climate would be needed to produce a given change in health and energy. Judging by the effect of given climatic conditions upon the death rate in the United States, the climate of Athens in Greece appears to be about as healthful as that of Augusta in Georgia and Vicksburg in Mississippi. A change involving the following points would apparently raise it to the level of New York and Chicago, which enjoy almost the most stimulating climates in the United States:

1. Temperature of July 77° F. instead of 81° F; January 48° instead of 46°. Mean temperature of the year 62.0° instead of 63.1°.

2. Relative humidity at all seasons 10 per cent higher than now, January, the moistest month, 84 per cent instead of 74 per cent; July the driest month, 58 per cent instead of 48 per cent.

3. Annual rainfall 22 inches instead of 15, ranging perhaps from 3.3 inches in November to 1.0 in July instead of 2.9 in November and 0.3 in July.

4. Number of storms twice as great as now.

Whether this is exactly the kind of change that has taken place we do not yet know, but there is strong evidence that when Greece was in its prime the climate was stormier than now, and approached more or less to the conditions indicated above. The noteworthy fact is that so small a change, scarcely more than the normal variation from one year to another, would apparently make a difference sufficient to give Greece a climate as healthful and stimulating as that of the regions that now are most progressive. Since most regions where civilization was once high but has now greatly decayed show signs of adverse climatic changes, it seems to the authors of this book that the relation of climate and civilization was probably the same in the past as at present. That is, climate appears to be the main factor in determining the broad general outlines of the distribution of health, energy, civilization, and productivity. But, on the other hand, relief, soils, minerals, and facilities for transportation, and likewise migration, natural selection, racial inheritance, parasitic diseases, food, clothing, shelter, occupations, density of population, and stage of culture introduce great modifications in the distribution which would result from climate alone. They lead to such features as the brilliancy of Athens in the past, the present remarkable development of Hawaii, and the contrast between the Black Belt and the Kentucky mountains. Yet climate still seems to remain the most widely effective of all the great factors in determining the distribution of human activity and productivity.

EXERCISES AND PROBLEMS

1. Let different members of the class prepare isopleth maps from each column of Table 46, omitting column E. How far do the various maps resemble Fig. 43? Which map probably comes nearer to representing the health of homogeneous groups of people, that is, of groups which are alike in sex, age, occupations, intelligence, percentage of foreigners, degree of congestion in cities, etc.? (see notes on Table 46). Which map is more likely to show the effect of climate? Which actually shows the most resemblance to Fig. 46? In your maps point out the features which seem to you to be due to (*a*) climate, (*b*) occupations, (*c*) cities, (*d*) possible inaccuracies of statistics, (*e*) racial conditions such as the presence of Negroes or of recent European immigrants.

2. How does the distribution of births compare with that of deaths (Table 46)? Make a map of excess of births over deaths. In what kinds of regions is the excess greatest? Is the birthrate high or low in the places having high infant death rates? a high general death rate? Why? What general conclusions can you draw as to the geographical relationship between births and deaths?

3. Explain the conditions as to stage of development, migration, occupations, transportation, and material resources which cause the distribution of health to be much more like that of climatic energy in Europe than in the United States.

4. Go through this book and make a list of all the maps of the United States, Europe, and the world which bear a strong resemblance to the corresponding maps of health and climatic energy. In how many different ways can the resemblances be reasonably explained? What does this suggest as to problems for scientific investigation?

5. Keep a record of your own feelings and of the weather for some weeks. See whether you find any systematic relation between your own energy and optimism and the kind of weather or the changes of weather.

CHAPTER X

DISTRIBUTION OF POWER AND INDUSTRY

The Relation of Power to Progress.—Having studied the general principles governing the effect of climate, relief, and soils upon the amount and kind of productivity in different parts of the world, we must next ascertain the part played by minerals. We shall here confine ourselves to the fuels and other sources of power, deferring the metals and stony products to Part II.

The mineral sources of power, as usually defined, include coal and petroleum (with natural gas), but water and wind are also mineral substances. At present the approximate percentages of power and heat, as measured in heat units, supplied by various means are as follows: coal, 65; oil, 18; wood, 6; water, 4; natural gas, 4; work animals, 3; and wind less than one-tenth of one per cent.

The use of wind for power has declined so much that it will be omitted from further discussion. Work animals and wood are discussed in other chapters.

Before we discuss the other five, it is necessary to remove certain common misunderstandings. For a century, steam power has influenced the world so profoundly that many people suppose that coal, the chief source of power, is actually the cause of modern manufacturing and transportation, and that these are a primary cause of recent progress in civilization. This mistake should be carefully guarded against. Coal did not cause England, for example, to become a leader in manufacturing and commerce. Before the invention of the steam engine England was already the world's leader in both respects. English cloth, made by hand, was famous in many countries; English cutlery, tools, and machines were the best to be had; and English ships were sailing to all parts of the world. Then as now, they were the most noteworthy carriers of commerce. Next to England in these respects came the neighboring North Sea countries, Belgium, France, the Netherlands, and Germany. Switzerland, too, was famous for fine clocks and watches, cotton cloth and silks, just as to-day. In the New World before the time of the steam engine, New England was the chief manufacturing center; cotton from the South was shipped to that section and the fin-

ished product shipped back again much as at present. Commerce, too, was more active from Boston to Baltimore than farther south. In short, except for almost uninhabited regions, like the United States west of the Appalachians, to which Europeans have since migrated, the general centers of industry and commerce were then almost the same as now. This was true even in countries like Japan where beautiful silks, pottery, lacquer work, and many other types of manufactured goods were produced abundantly long before the introduction of modern machinery.

Then came the steam engine. Its use in manufacturing stimulated the growth of old cities and caused new ones to spring up; its use in transportation did likewise, and shifted ocean commerce from the small shallow ports to the large ones with deep harbors. In many cases the seaports simply shifted downstream and remained on the same river as before. The general regions which had formerly been most active in manufacturing and commerce still maintained their supremacy. Switzerland, for example, has no coal, but it felt the stimulus of steam power almost as much as did England. So, too, with the Netherlands, whose ships obtained their coal from England; and with New England, whose manufacturers brought coal from Pennsylvania, 300 to 500 miles away.

The Real Part Played by Power in Manufacturing.—The real secret of the geographical distribution of the *use* of coal, water, or any other source of power may be understood from an illustration. Suppose a score of cabinet-makers are at work, each in his own shop. All make tables by hand, but some build square-cornered tables of undressed pine, others construct carefully dressed pine tables with legs turned in a foot-power lathe, and the most skillful devote themselves to carving and polishing beautiful tables of hard walnut and mahogany. Each does his best, but none has good tools. Now suppose one of the most skillful invents a power lathe run by a waterfall. What will be the effect? The owner of the lathe will make more and perhaps better tables than before. The other men who are equally skilled will either set up lathes if they have water power, or will hire the owners of the power lathes to do their turning for them. The man who is only skillful enough to make undressed tables with square legs will not bother about the new invention, even if he has a fine waterfall.

This illustrates what happened when the steam engine was invented. The people who were already skillful and who had coal of their own soon profited greatly. Belgium, northeastern France, western Germany, and Pennsylvania were the chief regions of this kind aside from England. Other skillful people who had no coal began at once to import it. Switzerland, Sweden, and New England are among the chief examples of this type. The moderately skillful manufacturers in Italy, Spain, Russia,

and Louisiana imported or mined what coal they needed, but did not increase their manufactures nearly so rapidly as did the regions where manufacturing was previously well developed. The unskilled manufacturers of China, India, and Siberia, even though having fine supplies of coal, paid no attention to the new methods until people from more highly developed regions forced them to do so. The presence of coal or any other source of power has never made any nation civilized, nor has it greatly changed the *relative* positions of the nations in manufacturing or commerce. It has, however, greatly stimulated the countries that were already active, and it causes certain industries to be located in certain places—steel works in Pennsylvania, for example.

No source of power illustrates this better than petroleum. The United States happens to be the world's chief producer and chief consumer. But some of the largest consumers are Great Britain, Germany, and France, all of which have only scant supplies within their own territory and in the regions which they control politically. Although the entire British Empire, previous to the British mandate over Mesopotamia, produced less than 1 per cent as much oil as the United States, Great Britain equipped many of her naval vessels as oil burners. She knew that the energy of her people would secure the oil, though it might come from backward regions in Mexico and Russia. Thus the progressive countries are stimulated by the discovery of new sources of power, even though those sources lie outside their own territory.

The Relative Distribution of Coal and Manufacturing.—The relative distribution of coal and of manufacturing is well illustrated in Fig. 49. The left-hand side shows the amount of coal mined in the various states in 1923. (Pennsylvania, with anthracite as well as bituminous coal, stands far in the lead.) It mines 40 per cent of all the coal of the United States, and 19 per cent of that of the world. The next four states, West Virginia, Illinois, Kentucky, and Ohio, when combined, produce a little more than Pennsylvania. Four other states, Indiana, Alabama, Virginia, and Colorado, complete the list of those that produced more than 10,000,000 tons apiece in 1923. These nine produce nearly 92 per cent of the country's coal, and are the only states that can be called large producers. Yet only four, Pennsylvania, Illinois, Ohio, and Indiana, are among the nine greatest manufacturing states, as indicated on the right side of Fig. 49. Of the other five states that lead in manufacturing, Michigan has a very small supply of coal but can easily be supplied from Illinois, Pennsylvania and other states; New York and New Jersey have no coal, but can easily get what they need from Pennsylvania; Massachusetts has none and can get it only at considerable expense; while California not only has none of its own, but has to

pay more for it than does almost any other part of the country. Thus the leading manufacturing states range all the way from most favored to least favored so far as coal is concerned. On the other hand, although West Virginia and Kentucky are two of the great coal states they rank low in manufacturing.

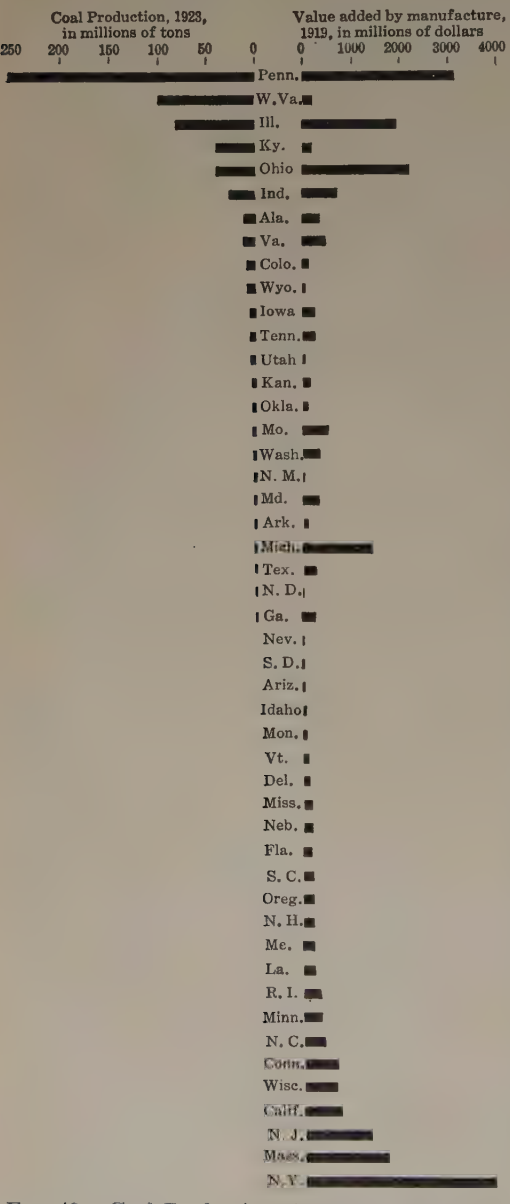


FIG. 49.—Coal Production Compared with Value Added by Manufacturing in the United States.

The idea that the distribution of manufacturing depends on that of coal is so widespread that we may well test it by the strict mathematical method of correlation coefficients. This method shows whether two sets of phenomena are really related. If one varies exactly with the other, as the length of the day varies with the noonday distance of the sun from the zenith, the correlation coefficient is one. If there is no relation whatever the coefficient is zero. But suppose two things have a relation like that of the corn crop and the summer rainfall, where the amount of corn depends partly on the rain, but also on other things such as temperature and insect pests. In that case the correlation coefficient is between one

and zero, and is expressed as a decimal. Applying this exact method to a comparison between the amount of coal mined per capita in the various states and the value per capita added by manufacturing, the correlation coefficient is practically zero, which means that there is no real connection. The presence of coal determines the *kind* of manufacturing, for heavy iron goods such as steel rails are sure to be manufactured as near the coal as possible, but the coal does not determine the *relative amount* of manufacturing. The use of coal has indeed increased the total volume of manufacturing enormously, but its effect has been as great in New Hampshire, California, or Switzerland as in Pennsylvania or England.

Let us see how the amount of coal mined per capita (Fig. 50) and

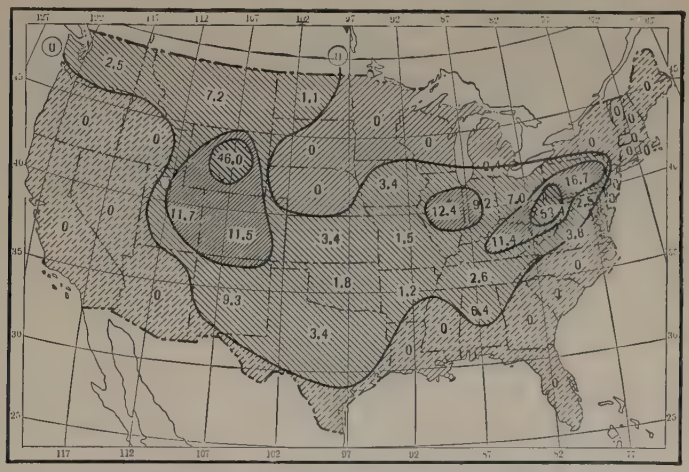


FIG. 50.—Per Capita Value of Coal Mined in the United States.

the per capita value of manufacturing (Fig. 51) compare when plotted on maps. In the coal map three centers are evident (see also Fig. 115, page 294); (1) the Appalachian field where West Virginia produced 64 tons per capita in 1923, Pennsylvania 28, and Kentucky 17; (2) the Illinois field which gave that state 12 tons per capita and Indiana 9; and (3) the Rocky Mountain field where Wyoming (39) almost rivals West Virginia in production per capita, although its aggregate production is small. The manufacturing map, on the contrary, displays only one great center, extending from the Atlantic Coast between Portland and Baltimore to Chicago and Milwaukee. Scarcely a hint of any connection between the two maps is discernible.

On the other hand, Fig. 51, and also Fig. 141, page 368, showing

the percentage of gainfully employed workers engaged in manufacturing, show an unmistakable resemblance to the maps of progress (Fig. 45), health (Fig. 46), and climatic energy (Fig. 43). The connection of the whole series can scarcely be doubted. Other factors, such as racial character, an early start, and nearness to markets and labor supply doubtless play a part in determining the distribution of manufacturing. On the other hand, among the purely physical factors of environment, the location of coal shows no discernible relation to the amount of manufacturing, whereas climate shows a close relationship, and hence must be regarded as one of the fundamental factors in determining how much coal is consumed to supply power for manufacturing.

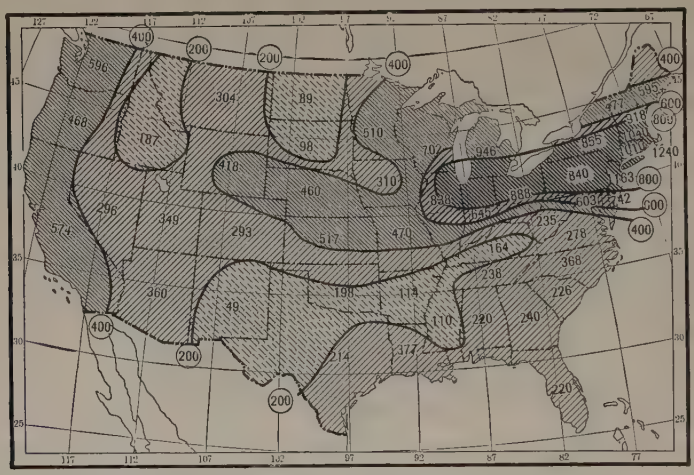


Fig. 51.—Per Capita Value of Manufacturing in the United States, 1919.

The World-wide Distribution of Coal.—An examination of the whole world likewise leads to the conclusion that there is little relation between the amount of coal in a country and the amount that is mined or that is used in manufacturing. In Fig. 52, the countries having the largest known resources of unmined coal are arranged according to those resources, as shown on the right. Notice how overwhelmingly the United States surpasses every other country. Its coal reserves almost equal those of all other countries combined. Canada and China come next, each with about a sixth of all the coal in the world. Siberia, Australia, the British Isles, and Germany form another group of favored countries, even though each has no more than 2 or 3 per cent of the world's total. Important manufacturing countries like France, Belgium, Japan, and Holland trail far behind with scarcely more than a fourth, or even a

fifteenth of 1 per cent. Now turn to the left-hand side of the diagram. How absolutely different it looks! It shows the annual production of coal in 1923. The scale is ten thousand times greater than that of the reserves. The United States with an annual output of about 600 million tons stands as markedly ahead of all other countries on this side of the diagram as on the other, but that is little more than an accident. If the United States had no more coal than Siberia or even Ukrainia, the character and number of its people would probably cause its production to rank close to the top. One reason for thinking this is that Germany

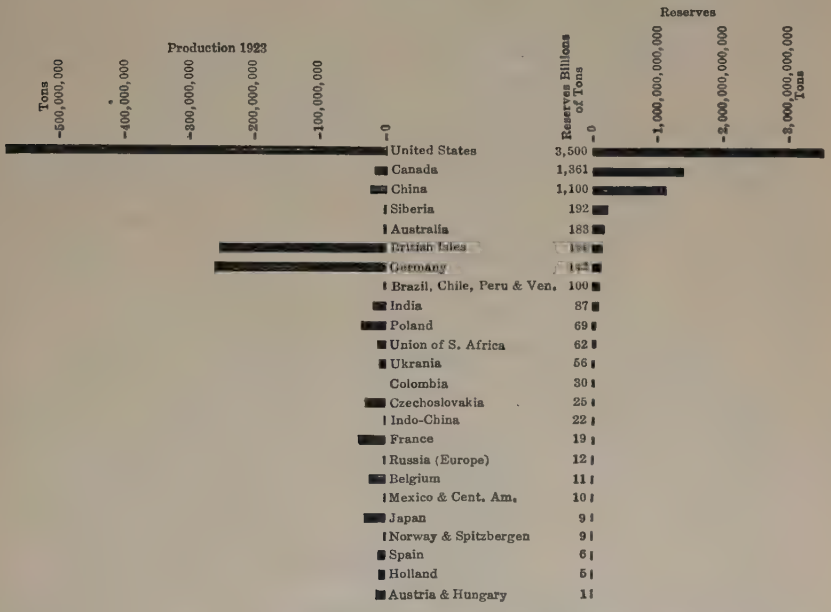


FIG. 52.—Production of Coal, 1923, Compared with Known Reserves of Coal.

and Great Britian, with less people than the United States and less coal than Siberia, mine half as much coal as this country, and about two hundred times as much as Siberia. Moreover, in proportion to their resources such countries as Poland, Czechoslovakia, France, Belgium, Japan, and Austria mine far more coal than the United States.

Petroleum and the Distribution of Motor Transport.—We are living in an era when petroleum, in the form of gasoline and lubricant, is helping to bring about changes perhaps as revolutionary as those connected with coal and steam a century ago. Petroleum by no means rivals coal in the energy which it supplies; the 1009 million barrels produced in 1923, for example, were capable of furnishing only one-eighth as much energy

as the 1338 million metric tons of coal mined that same year. The real importance of petroleum, however, is greater than appears from these figures. In the form of heavy, durable lubricants, petroleum has been one of the main factors in the development of the high-speed machinery

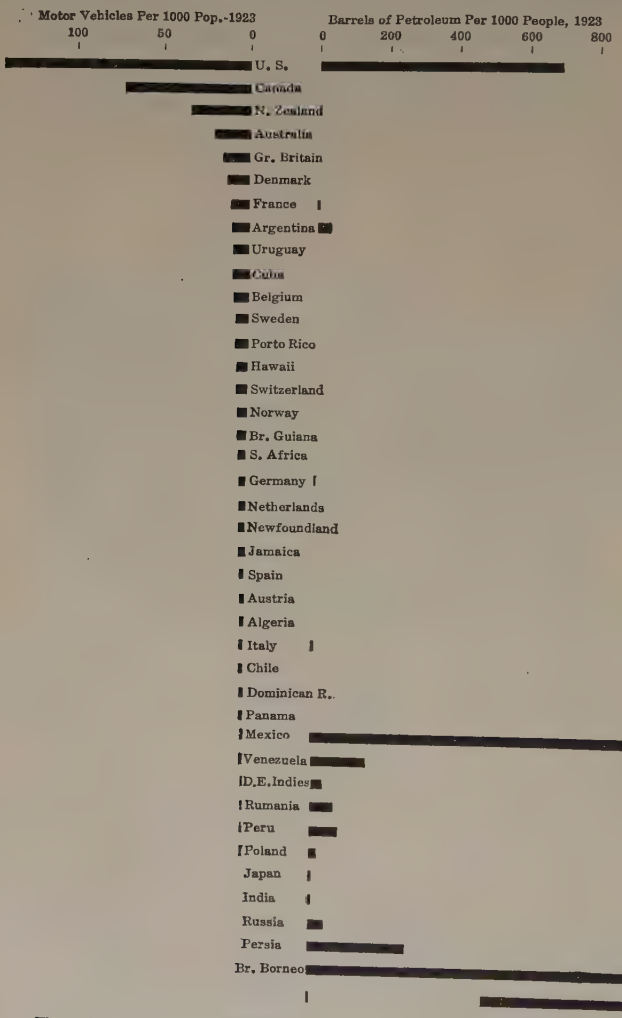


FIG. 53.—Motor Vehicles and Petroleum per Capita, 1923.

now used in all sorts of factories. Again, without petroleum the development of the high-powered, light-weight, explosion engine might have been impossible, and motor transportation and aviation would have been greatly hampered.

The geographical relations between motor transportation and petroeum, as illustrated in Fig. 53, furnish an admirable example of the part played by natural resources in determining where human progress shall take place. In the number of motor vehicles per thousand people, as shown on the left, the United States far surpasses any other country; n production of petroleum per capita it stands second only to Mexico and British Borneo. In absolute production it surpasses Mexico 5-fold and British Borneo nearly 190-fold. (See Map, Fig. 106.) One of the most interesting features of Fig. 53 is that aside from the United States, with a petroleum production of about 800 million barrels in 1924 and Argentina with 3 million, no country which has more than 3 or 4 motor vehicles per thousand people produces any important amount of petroeum. Mexico, with 150 million barrels in 1923, Russia with 38, Persia 25, the Dutch East Indies 15, Rumania 11, India 8, Peru 6, Poland 5, Venezuela 4, and Japan $1\frac{1}{2}$, had anywhere from one motor vehicle per 400 people in 1925, as in Mexico, down to one per 5000. Approximately, his latter ratio occurs not only in Persia, where petroleum has only ecently been found, but in Russia where petroleum has been known and ised longer than in almost any other country. Judging by Fig. 53 ve might infer that the presence of petroleum somehow tends to be asso-iated with few motor vehicles, but scores of regions have been omitted because they have neither petroleum nor motor vehicles in amounts arge enough to show in the diagram. Nevertheless, Fig. 53 makes it bvious that the distribution of petroleum has no more to do with the listribution of motor transport than the distribution of coal has to do vith that of manufacturing.

Petroleum Supplies and Motor Transport in the United States.— This does not mean that the distribution of petroleum and that of autonobiles are wholly independent. The case is like that of water power nd the makers of tables cited above. The automobile originated in Europe. The French, Germans, and British all took a hand, and by 900 were building automobiles as a practical means of transportation. Only at this stage did the United States take an important share in motor ransport. As late as 1904 the state of Michigan manufactured only 125 automobiles, whereas in 1924 it manufactured 2,682,000 passenger ars, without including trucks and motor cycles. In 1924 the United tates manufactured 3,540,000 motor vehicles, or 83 out of every hundred nade in the whole world.

The great abundance of petroleum is generally given as the chief eason why the United States has such a remarkable lead in motor transort. This is undoubtedly one of the great reasons, but Fig. 53 sugests that other causes are equally important, if not more so. (1) The

development of motor transportation in Europe was greatly set back by the World War. Now that the European countries are recovering, their motor vehicles are increasing faster than those of the United States, as appears from the following figures showing the percentage of increase in registration from 1921 to 1925:

Asia	37	Africa	81
Canada	37	Europe	91
United States	69	Australasia	140
Latin America	72		

(2) In Fig. 53 Canada, New Zealand, Australia, Great Britain, Denmark, France, Argentina, and Uruguay stand next to the United States in number of motor vehicles per thousand persons. None of these except Argentina produces petroleum to any appreciable extent. On the other hand, in proportion to their population they are the richest countries in the world aside from the United States, and certain exceptional minor areas like Cuba. Only a very wealthy population can afford a car for every family, or even for every 10 families. The United States is so rich that it can afford 7 passenger cars for every truck, and wants only one motorcycle for every 113 passenger cars. Europe, on the other hand, can afford only 2.3 passenger cars for each truck, and uses one motorcycle for each 1.7 passenger cars because it cannot afford the more expensive conveyance. Since the United States has a similar excess in pianos, radio outfits, phonographs, moving pictures, new houses, silk dresses, and many other luxuries, it is quite certain that even if the country produced no petroleum, the activity and energy of its people, their vast natural resources, and their consequent wealth and power would at least cause their use of automobiles to rival that of countries like New Zealand, Australia, and Canada.

The real relation of petroleum to motor transportation seems to be like that of coal to manufacturing and railways. Just as the presence of abundant and excellent coal in England gave that country a great start when her own people and those of neighboring countries invented the steam engine and other machinery, so an abundance of petroleum in the United States gave this country a great advantage when Europeans invented the automobile. The same thing may be true of aviation when once it reaches the stage where the cost of fuel becomes an important item. Moreover, the world as a whole has made much more rapid advance in motor transportation than would have been possible had there been no such supplies of petroleum in a highly progressive country. Nevertheless, other countries like Canada, New Zealand, and Australia, which belong to the same type as the United States, are also making

marvelous progress in motor transportation even though they have no petroleum. They illustrate the great principle that no matter who makes an invention or who possesses the natural resources needed to make it practicable, the people who use the invention are those with most energy and the highest civilization. Such people reach out all over the world to get a resource like petroleum. This makes all sorts of commercial and hence political complications, as in Mexico, Mesopotamia, and Persia.

The Place of Water Power.—Modern inventions have brought so many innovations that in one sense water is almost as young as petroleum as a source of power. In the long run it may be the most important of the sources thus far utilized. Unlike coal and petroleum, the water of rivers and lakes is constantly renewed; unlike wood, it is not needed for other uses which limit its use for power; and unlike wind, it is comparatively reliable. Its advantage over animals, which are an equally permanent and reliable source of power, is that it is provided by nature almost ready-made and can be used in large units.

Water versus Coal and Oil as a Source of Power.—We have seen that although coal and petroleum are a great stimulus to manufacturing and transportation, they exert this influence mainly in advanced countries. Moreover, they influence advanced countries that produce no mineral fuels almost as much as those whose supplies are most abundant. The same principles hold true of water power, except that only recently has it been practicable to use water power except at the source. Even now, with the modern development of hydro-electric methods, it does not pay to transmit water power more than 400 or 500 miles. The Federal Power Commission of the United States estimates that the average losses of power in electrical transmission are as follows: 100 miles, 8 per cent; 200 miles, 10 per cent; 300 miles, 13 per cent; 400 miles, 17 per cent; 500 miles 21 per cent. With large plants and high voltages a "shrinkage" of not over 10 per cent for 300 miles is possible. Such a shrinkage may cost less than the transportation of coal by rail, but is much more than the cost of sending coal by water or of transporting oil in pipe lines. Moreover, for each additional hundred miles of electrical transmission the percentage of losses increases, as appears above. Thus, water power is still a relatively local resource.

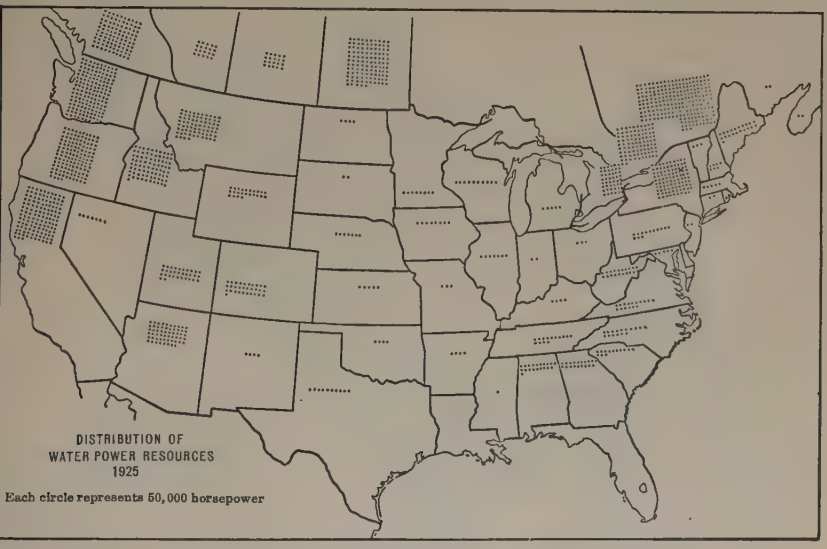
Conditions Determining the Value of Streams for Water Power.—The United States Geological Survey estimates each power site according to two standards, depending on the amount of water available 90 and 50 per cent of the time respectively. The Dominion Water Power Branch of Canada uses almost the same standards, namely, the flow available at ordinary minimum, and the flow dependable for six months.

A river whose volume remains nearly the same at all seasons is obviously far more valuable than one that varies greatly from flood to low water. The Niagara and St. Lawrence Rivers are especially steady at all seasons because of the storage capacity of the Great Lakes. For that reason, in New York the power available 90 per cent of the time is only 1.2 as abundant as that available half the time, and in Ontario only 1.4 (Table 30). On the other hand, the Potomac River carries 250 times as much water in extreme flood as in drought. A similar variability in the volume of the rivers gives Pennsylvania, Ohio, Indiana, and West Virginia high ratios (2.5 to 3.0) between the water available 90 and 50 per cent of the time. Such ratios are closely correlated with the fact that many of the most disastrous floods in the United States occur in this region, as at Johnstown in 1889 and Dayton in 1913. A flow of water available less than half the time is of little value unless stored by means of dams and reservoirs, which are often prohibitively expensive. In glaciated regions such as eastern and central Canada, New England, Wisconsin, Minnesota, and Scandinavia, the irregularity of the land provides not only many natural reservoirs in the form of lakes, but many natural rapids.

Distribution of Water Power in the United States and Canada.—Fig. 54 shows the distribution of water power that may some day be available in the United States and Canada at least half the time. In Canada the dots, each of which indicates 50,000 horse power, are all placed near the southern border, even though part of the power may be generated farther north. But southern Canada is where it will mainly be used, for there the climate is mild enough to permit agriculture and to make transportation fairly easy most of the year.

The most noteworthy feature of Fig. 54 is the concentration of power in four areas. (1) A fortunate combination of high mountains and heavy rainfall gives southwestern Canada and especially the northwestern United States over one-third of the potential water power of the two countries. The main center to which this vast supply is tributary is the fertile region surrounding Puget Sound. (2) New York, Ontario, and Quebec possess more than a quarter of the 87,000,000 horse power which theoretically may some day be available in the United States and Canada. In actual practice the cost of installation will probably make it impossible ever to utilize more than a fractional part of the actual fall of water in the streams included in the estimates. This, however, does not alter the general principle, although it means that we must greatly reduce the theoretical figures quoted here from official sources. In the northeastern United States and southeastern Canada the steady overflow of the Great Lakes down the Niagara and St. Lawrence

Rivers is the main source of power, but many other rivers play a part, especially in the province of Quebec. Most of this huge supply will presumably be used in the strip of Canada from southern Ontario to Montreal or even Quebec, and in the neighboring parts of the United States, especially central New York. (3) The third concentration lies in the southwestern United States, especially northern Arizona, and is due to the Colorado River and its tributaries. This power may possibly be used for manufacturing on the high plateau bordering the Colorado Canyon; for manufacturing, as we have seen, seems to flourish best where



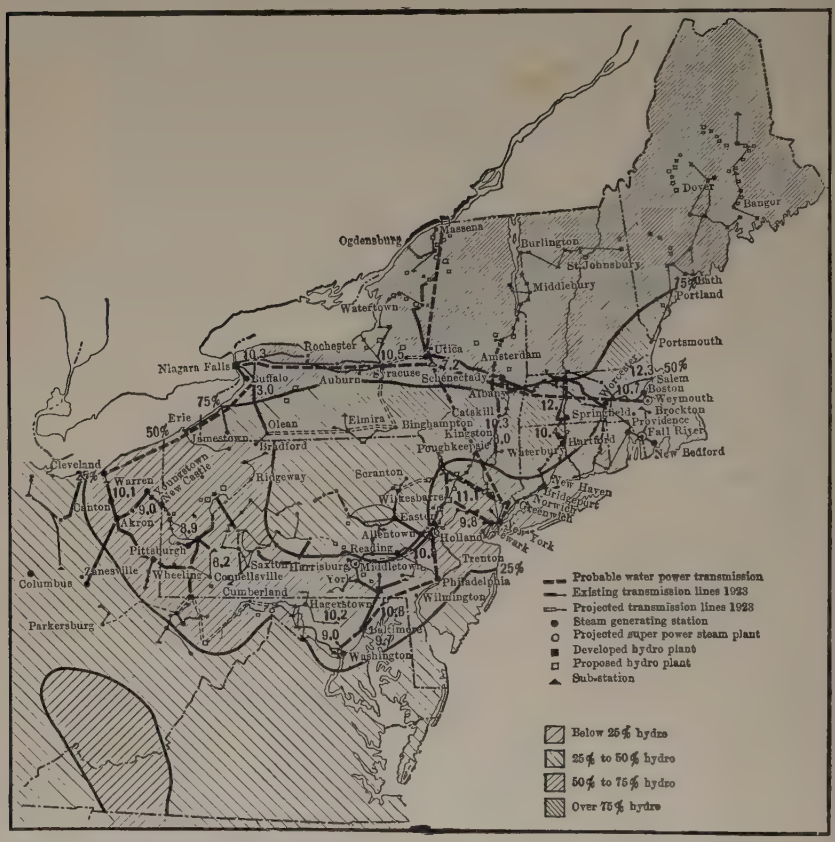
U. S. Federal Power Commission and Yearbook of Canada.

FIG. 54.—Water Power Resources of the United States and Canada.

the climate is most healthful and stimulating. It may, however, be transmitted to the Pacific Coast near Los Angeles, and used for farms as well as for manufacturing. In all progressive countries the farms tend more and more to be important consumers of energy. They use it not only for lighting and heating, but for cutting wood and silage, churning cream, and many other purposes. (4) The last and smallest of the four concentrations is located in the southeastern United States, and is due to the heavy rainfall and fairly great height of the Appalachian Mountains. The power is utilized mainly in the foothill belt on both sides of the mountains, one side being represented by the abundant cotton factories of the Piedmont region in the Carolinas and Georgia, and the other by the famous power site of Muscle Shoals, where the

fixation of nitrogen for fertilizer is considered the most important purpose.

The approximate way in which full use of water power would work out in the northeastern United States is illustrated in Fig. 55, pre-



From reports of U. S. Power Commission.

FIG. 55.—Proposed Super-power System of the Northeastern United States.

Shading indicates percentage of power which might be derived from water in 1935 if resources were well utilized. Pairs of numbers indicate cost of power without use of water power (above) and with use of water power below.

In studying this map care must be taken to distinguish between transmission lines and lines that separate areas where different percentages of water power are available.

pared by the Federal Power Commission. The shading shows the percentage of the total power requirements which might be met by hydroelectric power in 1935 if all the available water power were utilized —a condition which is by no means probable. The various pairs of

gures show the estimated cost of power per kilowatt-hour in mills. The upper is based on the assumption that all the power is derived from oal, the lower on the assumption that water power is used to the best dvantage as indicated by the shading, Buffalo being wholly dependent n water power, and certain other areas using less than 25 per cent. In laces like New York, Boston, and Philadelphia, even when all the water ower has been harnessed, it will resumably be used mainly as a sup- lement to steam, especially to carry eak loads. (Fig. 56.) Such loads epresent a great demand for power uring only a few hours. They are ery expensive because they make ; necessary not only to provide nuch more extensive equipment han is needed the rest of the time, ut to keep up steam so that power ill be available the moment the oad comes on, for example during he rush hours of traffic. If water held in check behind diversion ams it does not burn itself up like oal under the boilers, but simply ccumulates, and can be led to the urbines whenever it is needed and o longer.

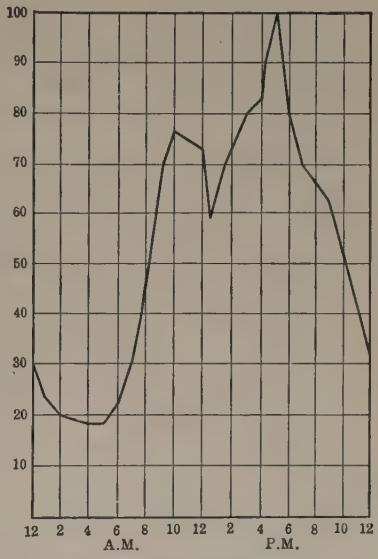
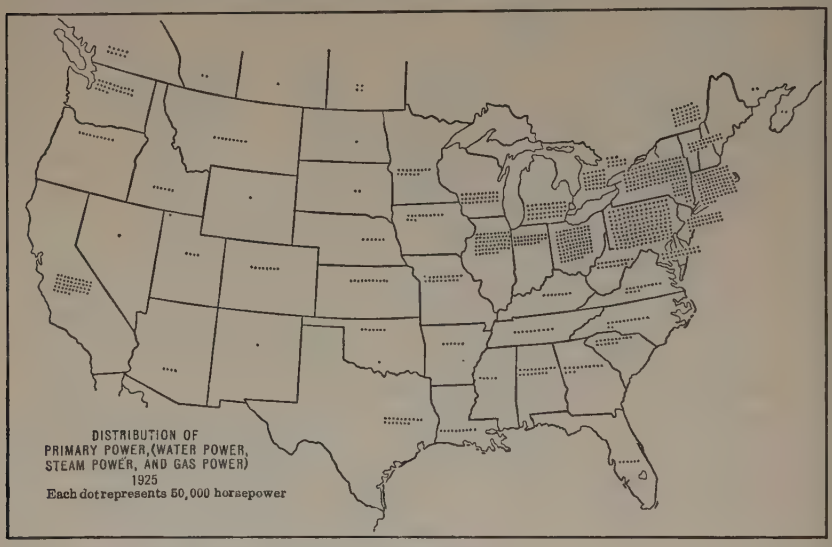


FIG. 56.—Hourly Variations in Load of New York Edison Co., with Peak at 5 P.M.

Geographical Relations of Water Power and Manufacturing.—The here presence of water power, as of coal, is not enough to cause manu- acturing. This is obvious from a comparison of Fig. 54 showing the dis- ribution of water power resources and Fig. 57 showing the amount of ower used for practically all purposes except steam railroads, auto- nobiles, and farms. New York is almost the only state that ranks very igh both in potential water power and in the total amount of power sed in its industries. But even there the two facts have little to do ith each other, for much the larger part of the power used in New York tate is consumed near New York City, whereas the water power is ainly developed at Niagara. Moreover, New York held practically s present rank as a consumer of power long before hydroelectric power as available. States like Massachusetts, Connecticut, Pennsylvania, hio, Indiana, Illinois, and Michigan present an interesting contrast in he two maps; they consume enormous amounts of power in proportion

to their supply of water power. Washington, Oregon, Idaho, Montana, and Arizona present a contrast of the opposite kind—huge supplies of water power, but relatively slight use of power of any kind as yet.

This same type of contrast is brought out in Fig. 58, which shows the total amount of water power which may some day be developed in each of nine sections of the United States, and the percentage of that power thus far developed. Notice how the relative proportion of the circle that is shaded decreases from New England to Texas. Evidently



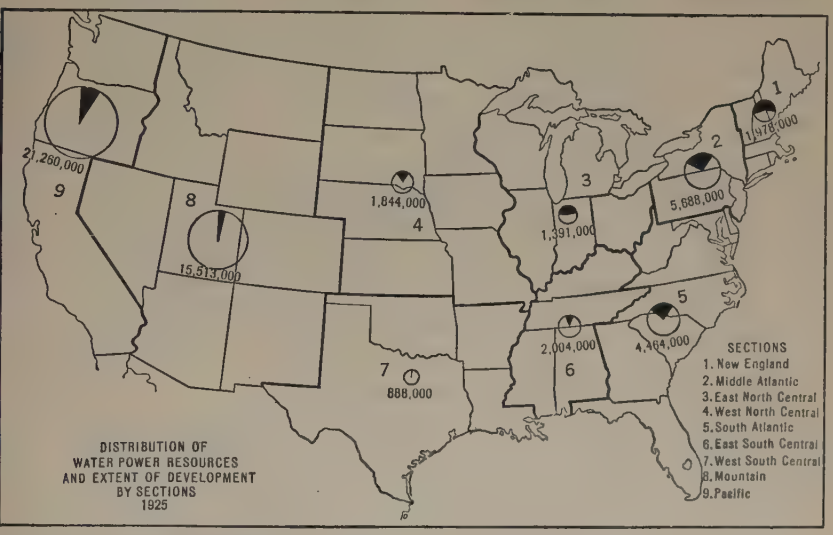
U. S. Federal Power Commission and Yearbook of Canada.

FIG. 57.—Primary Steam Power, Gas Power, and Water Power in the United States and Canada.

the growth of manufacturing has not impelled the people of the South and West to develop their water power to any such degree as in the northern states east of the Mississippi. New England stands highest in the percentage of developed water power, because (1) it began to manufacture before coal became the chief source of power; (2) it has no coal; (3) its glacial topography and moderate ruggedness cause abundant rapids and lakes, both of which make the development of water power especially easy; (4) it has abundant rain at all seasons; (5) its population is dense and competent; and (6) its accessibility to the seacoast and to the labor supply of Europe has favored the development of manufacturing.

In the future it seems probable that further development of water power in the northeastern United States and southeastern Canada from

the Great Lakes to Maine will stimulate the manufacturing industries, but will not appreciably change their general location. It seems equally probable that the still greater supplies of water power near the Pacific Coast will serve as a great stimulus to manufacturing in that section, especially around Puget Sound. Practically all other conditions are also favorable; the people are highly energetic and intelligent, the climate is one of the best, population is growing so that labor is becoming available and markets are increasing, and the great growth of commerce with



U. S. Federal Power Commission.

FIG. 58.—Water Power Resources and Extent of Development in the United States, by Sections.

Large numbers indicate horse power available 50 per cent of the time. Shaded areas indicate percentage developed up to 1925.

the Far East is opening huge markets and at the same time supplying all sorts of raw materials.

The probable effect of the development of the two minor concentrations of water power is not so evident. Already the Appalachian rivers have joined with the presence of cotton and of an unused labor supply to encourage a great development of cotton factories in the Carolinas and Georgia, but as yet there does not appear much tendency toward highly diversified manufacturing, a tendency which is strongly marked on the Pacific Coast. The southwestern water power center is only in its infancy as appears from the narrowness of the black wedge in Fig. 58. Although the potential water power of Arizona and Utah is four-

fifths as great as that of New York State, the amount developed is only one-tenth as great. (Table 30.) It will be interesting to see whether this large unused supply of power is devoted to agricultural purposes and manufacturing in Utah and Arizona, or is transmitted to the coast of California where Los Angeles lies only four or five hundred miles from the main power centers.

Water Power in Foreign Countries.—In foreign countries, just as in the United States, the amount of available water power shows no relation to the amount of manufacturing. Africa (Fig. 59) is estimated to have over 40 per cent of the world's potential water power. Belgian Congo alone, with its heavy rainfall, its great Congo River and a dozen huge

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 59.—World Map of Potential Water Power.

Each dot represents 1,000,000 horse power.

tributaries descending from the inner highlands, has $2\frac{1}{2}$ times as much potential water power as the United States, but only 250 horse power are developed; French Congo has as much as the United States but none is developed; little Liberia, only three-fourths as large as New York, has about as much water power, although none is developed. Madagascar, with 5,000,000 horse power available 90 per cent of the time, has only 100 horse power developed; whereas Switzerland, with only 1,400,000 potential horse power, has developed no less than 1,070,000. In few other regions is there so great a concentration of water power as in the Himalayas; but all India, with 27,000,000 horse power running to waste practically all the time, had developed only 150,000 in 1920. On the other hand, Japan with 6,000,000 had developed 1,000,000, and Norway with 5,500,000 had developed 1,350,000, and both are actively developing more. Peru (4,500,000) rivals Sweden in pos-

sibilities, but has developed only 36,500 horse power in contrast with 1,200,000 in Sweden. Even flat little Denmark, lacking coal and needing much power for its highly developed manufacturing industries, has developed 1500 horse power out of its potential 2000 available 90 per cent of the time. All these facts and many others to be gleaned from Table 29 show that water power in itself does not lead to manufacturing, but if a country has the temperament and ability which lead to manufacturing, that country is practically sure to develop such water power as it has, with relative rapidity. In the world at large, as in the United States, one of the most interesting of future problems is what will become of the vast power available in places like Equatorial Africa. Will it remain almost unused? Will it be highly developed and used for industries in Africa? Or will means be found to transport it as far as the North Sea region to people already active in manufacturing? Similar questions arise as to other tropical regions—the slopes of the Andes, Himalayas, and Western Ghats of India, the mountains of Burma, Siam, and Indo-China, and the huge island of New Guinea. As the prices of coal and petroleum rise, the value of tropical countries as sources of power is bound to increase greatly.

EXERCISES AND PROBLEMS

1. Compare the growth in the use of petroleum with the growth in population. From the following data plot a curve showing the per capita consumption of petroleum in the United States at the end of each decade: 1870, 0.13; 1880, 0.52; 1890, 0.72; 1900, 0.83; 1910, 2.10; 1920, 4.27. Explain the sudden change in the direction of the curve. If present tendencies should continue, what would be the approximate per capita consumption in 1950? About how many barrels would that mean per year?

2. Study the sections of the *World Atlas of Commercial Geography* dealing with coal, or petroleum, and prepare a report and maps showing the relative distribution of production and of reserves. Table 26 in this book and a statement of coal reserves in the *World Almanac* may help you.

3. From Tables 27 and 28 and from the *World Atlas of Commercial Geology*, make a study of the power resources of your state. Examine the table in the *World Atlas* showing the proportion of the coal output used for various purposes. Determine the proportion of fuel used in different types of manufacturing as given in Table 17 in the section on manufacturing in the State Supplement of the Fourteenth Census (1920). Find out where the fuel used in your region comes from. Write a general report on the whole subject.

4. Compare the use of power in your own state and in some other state of quite a different type, using the methods of Exercise 3.

5. Make a similar comparison, so far as possible, between your state and two foreign countries, one advanced, and the other backward.

6. Compare the coal-producing and the manufacturing states of the United States to see whether there is any distinct difference in the types of industries. From

Tables 27, 31, and 32 prepare a table of industries containing two parts: (*A*) The 9 states producing the most coal, (*B*) the remaining 9 having the largest amount of manufacturing as indicated in Table 31. After the name of each state write the names of the three chief manufacturing industries with their percentages. Underline the industries that are great coal consumers, namely, iron and steel works, foundries, and glass-blowing. Note that iron and steel require the largest amount of fuel, and foundries come next. On the other hand, industries like ship-building, automobile-making, and railroad repair shops, although they consume much iron, use relatively less fuel because they buy their iron goods largely in the form of shaped products of iron and steel mills and of foundries. Draw conclusions as to the kind of industries which predominate in coal-producing states compared with others.

7. Comparison of water power and manufacturing. Make a graph like Fig. 49, but substitute developed water power for coal production. (Tables 30 and 31.) Make another graph like Fig. 52, but use developed and potential water power instead of coal mined and coal reserves (Table 29). Discuss both tables and draw conclusions as to the present and future distribution of the use of water power.

CHAPTER XI

TRANSPORTATION: EQUALIZER OF SUPPLY AND DEMAND

The Function of Transportation.—The greatest of transportation systems are engaged in carrying freight far more than passengers. Few railroads would even pay their operating expenses if they had to rely solely on passengers for revenue. Roads like the New York, New Haven, and Hartford, or the Long Island Railway, which derive half or more of their revenue from passengers, have had unusual financial difficulties. In the United States as a whole, three-fourths of the railway receipts are from freight. The revenue from passenger service, including fares, mails, and express, averages about $2.50 per mile of train service, while for freight trains the revenue is about $7.00 per freight train mile. The Pennsylvania System derives two-thirds of its revenue from freight. In 1924 it owned 266,367 freight cars against 8190 passenger cars; and its freight traffic amounted to 2,335,000,000 car miles against 480,000,000 car miles for its passenger traffic. Over each mile of its railroad on an average it carried 550,000 passengers and 3,613,000 tons of freight.

Again, of the ocean steamers owned in the United States, the great majority are freight ships. Even though a huge ship like the *Majestic* is primarily a passenger vessel, its load of freight furnishes a large share of the net profits. Moreover, if the commuters are included, probably 95 per cent of all the passenger traffic on railways, trolley cars, and boats is for the purposes of business. All this is an attempt to make the supply equal the demand, for the passengers are going to the places where their services are needed, or away from places where they are no longer needed. Only a few railways, like the Pike's Peak road, were built largely for passenger traffic and belong to the types of business dealing with recreation. A still smaller number, such as the French railways in Indo-China and especially the railways parallel to the frontier in Germany, were planned primarily for political and military purposes. Thus the main purpose of the world's transportation systems is to carry the world's great products and thereby equalize supply and demand.

The Factors Determining the Importance of Transportation Routes.—From this it follows that the importance of a route depends primarily upon the volume of surplus products available along its course and

especially at its terminals. If many goods are shipped, there are sure to be many passengers. But mere numbers of people give no guarantee that a route will be important. French Indo-China is a populous region with about 19 million people—69 to the square mile; it lies adjacent to main lines of traffic. New Zealand has only a million and a quarter people—12 to the square mile; and it lies thousands of miles from any main route. Yet the New Zealand steamers are more frequent, regular, and rapid than those to Indo-China; they are also better boats, and make much better connections. This is true of steamers from each of the continents.

The main reason for this difference is that the New Zealanders and their Australian neighbors are extremely productive. The average New Zealander produces 16 times as much, exports 35 times as much, and imports about 44 times as much as the average Indo-Chinese; the corresponding figures for Australia are 13, 19 and 31 (Table 39). To put the matter in another way, the remoteness of New Zealand and Australia is of little importance compared with the fact that the activity of their inhabitants and the opportunities of a new country cause the foreign commerce of 7 million people there to be worth nearly 10 times as much as that of 19 million in Indo-China.

Productivity is not the only factor in causing trade routes to differ in importance. Intercourse with Australia and New Zealand, for example, is also fostered by the fact that ties of race, government, customs, and language bind them closely to England and the United States, the two greatest commercial nations. The pioneer disposition of the people and the opportunities for settlement also stimulate passenger traffic, thus adding to the importance of the routes. The point to be emphasized is that the difficulty of reaching a place has little to do with the importance of the routes thither. On the oceans difficulty is measured largely in mere distance, but storminess and the condition of harbors are also important. On land, the weather and relief give rise to similar difficulties. But these again have little effect on the degree to which a route is used. The railroads from the East to San Francisco traverse hundreds of miles of practically uninhabited country and climb 7000 feet over difficult, winding tracks hemmed in with snow sheds. Yet it pays to run a hundred trains over them where it does not pay to run a single train over a level line 5 miles long in the mildest kind of climate from a wayside junction to a sleepy village of 500 inhabitants.

The World's Greatest Routes.—The most important route in America, and perhaps in the world, connects New York and Philadelphia. These great cities not only exchange the products of their own hinterlands, but gather the surplus of vast areas both in the United States

and abroad. Of the same nature although not quite so important are the routes (*A*) from Detroit to Chicago, (*B*) Boston to New York, (*C*) Philadelphia to Baltimore and Washington, (*D*) New York via Buffalo and Cleveland or Detroit to Chicago, and (*E*) Philadelphia via Pittsburgh to Chicago or St. Louis. Other main routes run from Chicago and St. Louis westward to Seattle, San Francisco, and Los Angeles. In Europe one of the greatest routes is from London to Liverpool, while other great routes run from London to Paris, Paris to Berlin, to Vienna, and to Rome; from London to Berlin via Holland, and from London to Liverpool and Glasgow. Greater than any of these land routes, and greatest of all routes is the waterway that draws its traffic from Baltimore, Philadelphia, New York, Boston, and smaller ports, crosses the North Atlantic, and divides again to Liverpool, Southampton, London, Cherbourg, Antwerp, Hamburg and other cities. (Fig. 1.)

All these routes are alike in one great respect; the details of their location are determined by plains, valleys, mountains, lakes, rivers, ocean currents, harbors, winds, ice, or fog, but their general position depends on the fact that they connect centers of human activity. For example, the exact position of New York is determined by a fine harbor to which the Mohawk-Hudson Valley gives easy access from the interior. But suppose there were no such harbor and valley; the great Atlantic trade route would still terminate somewhere in that vicinity. It might enter America at Boston, New London, New Haven, or Philadelphia, but it would have to exist because the numerous demands of the active population of the northeastern United States would still continue even if there were no New York. Thus we conclude that great routes of transportation grow up because active regions need to be connected. When once established, the routes are powerful factors, causing the cities which they connect to become larger.

In the world as a whole, the greatest routes connecting active centers generally run east and west. The transcontinental railways of the United States and Canada are of this kind; so too are the trans-Andes railway from Argentina to Chile, the great railway east and west along the southern side of Australia, and the trans-Siberian road which connects the active Baltic portion of Russia with the active eastern Asiatic region which centers in Japan. The greatest railways that have been planned to run north and south must traverse warm, inactive regions, but their aim is to connect active centers in the northern and southern hemispheres. The greatest of all such projects is the line that will presumably some day connect the northern United States with Chile and Argentina. Another of the same sort is the Cape to Cairo Railway in Africa. On the sea likewise, the great routes gener-

ally run east and west to connect the great centers of trade, as appears from a comparison of ocean routes, Fig. 1, with foreign commerce, Fig. 64, and civilization, Fig. 48.

How Physical Conditions Determine the Detailed Location of Trade Routes. (1) *Distance.*—After the general location of a transportation route has been determined by the centers of human activity, the details are determined by physical conditions. Other things being equal, the shortest route is chosen. Hence on the ocean, in the air, and on plains, the routes of transportation run almost straight except for the curve of the earth. Many railroads boast that they are " airlines," and on their time tables they often distort the maps in order that their lines may appear to be straight and short.

(2) *Relief.*—Levelness is even more important than shortness. On the ocean or on lakes every route is level, while in the air no route can possibly be level. In this fact lies one of the greatest advantages of water communication over other forms, especially over communication in the air. In transportation by water, nothing is lifted against the force of gravity; in transportation in the air, everything must be lifted at least a few thousand feet and kept up. How much energy it takes to lift a body against gravity can be judged by trying to move a heavy automobile. On a perfectly smooth floor one man can start a vehicle weighing a ton or two, but he and several others cannot lift that same vehicle even an inch without a jack. So important is levelness that many long but level roads can compete with those that are much shorter but less level. For example, the " airline " between Boston and New York is shorter than any other but is little used because the hills not only cause it to go up and down but necessitate curves which limit speed and increase the cost of upkeep; the Delaware, Lackawanna, and Western route from New York to Buffalo (396 miles) is shorter than the New York Central (439), but its hilliness gives it great difficulty in competing with its rival. So too, the Southern Pacific or " Sunset Route " from New York by sea to Galveston and then across the Rockies to Los Angeles and San Francisco, is much longer than the direct routes from New York via Colorado, but because it is perfectly level on the ocean and relatively level on the land it easily competes with the far shorter and more direct but highly mountainous routes farther north. Among these mountainous routes the Denver and Salt Lake Railroad follows the Old Mormon Trail, and is relatively direct, but the fact that it climbs to 13,000 feet had much to do with its going into the hands of a receiver in 1915. Hilliness has an indirect as well as a direct effect, for it causes the population to be sparse. Between New York and Buffalo the largest cities on the short Delaware, Lackawanna,

nd Western Railroad are Scranton and Binghamton as contrasted with lbany, Utica, Syracuse, and Rochester on the longer but more level lew York Central.

(3) *Cost.*—Quite as important as levelness and shortness is the ost of construction, equipment, maintenance, and operation. This epends partly on the expense of tracks, terminals and so on, partly n the cost of the actual means of conveyance, and partly on the size f the units that can be handled by a single crew. In all these respects ater has a great advantage. No tracks are needed, and channels ust be dug only for short distances at the entrance to harbors; there re no taxes and no upkeep to pay on the right of way; the terminals ost no more relatively than do those of a railway; the cost of a ship f a given capacity is scarcely more than half that of cars and locomo-ves of corresponding capacity; and a given number of men can handle far larger load on a ship than on a train. This is illustrated in the llowing table:

	Average Number of Pounds of Fuel per Ton-mile	Average Number of Days' Labor per 100,000 Ton-miles
ailroads	0.066	2.5
reat Lakes carriers	0.029	0.9
hio River tow boats	0.021	1.3

Just as the water has an advantage over the land, so plains have an dvantage over mountains. The first cost of building tracks on the lain is only one-half, one-tenth, or even one-hundredth as much as mong the mountains; upkeep is correspondingly expensive in moun-ins and more trains and more men are needed for a given amount f work. As for airplanes, they are like steamers in having no expense r their right of way, but so long as the helicopter is not in practical use eir terminals are so large in proportion to the traffic that they are xtremely expensive. Moreover, the units are thus far of insignificant ze compared with trains and steamships. The largest airplanes yet uilt carry only about 20 passengers where a single railway coach arries 60, and only about a ton of mail or baggage against 40 for a ngle freight car.

(4) *Trans-shipment.*—An important but often neglected reason for e location of trade routes is the amount of trans-shipment. To trans-ip an average carload of miscellaneous freight, for example, from e line of transportation to another costs anywhere from one to six

dollars. If breakage and delay are added, the loss probably averages four or five dollars, or as much as to transport that same freight hundreds of miles. To transfer the same freight to a truck, drive to a wharf, transfer to a lighter, take the lighter out to an anchored steamship, and load the boxes into the steamer's hold may cost as much as to carry the boxes two thousand miles after they are once safely on the steamship. Hence, there is a strong tendency not only to avoid lighterage even at the expense of traveling several hundred miles to a deep harbor, but also to use a kind of land transportation that will pick up the goods as close as possible to their point of origin and carry them as close as possible to their destination without change of conveyance. So strong is this tendency that before the Panama Canal was built many ships, especially sailing vessels, found it cheaper to go around Cape Horn rather than transfer their freight to the Panama Railway and then to other ships for Hawaii, Japan, and China. In ability to carry goods with little trans-shipment the automobile has an enormous advantage over the railway, and the railway over water transportation. Since the cost of transportation alone *without trans-shipment* is about ten times as much by rail as by water, and perhaps ten times as much by truck as by rail, in spite of a widespread but mistaken belief to the contrary, and several times as much by horse as by truck, the problem of the business man is to find how much each trans-shipment costs including breakage and delay, how many trans-shipments are necessary by each mode of conveyance, and how their cost plus the cost of carriage and of delay compares on the various possible routes.

For example, many people have wondered why the Mississippi River is so little used in spite of the fact that from 1896 to 1920 nearly $600,000,000 were spent in trying to make it navigable. The answer lies partly in the fact that it flows in the wrong direction, for it does not go from the active Middle West toward the active manufacturing states of the northeast, and in that respect has none of the advantages which make the Great Lakes so wonderful a waterway. The answer also lies partly in the fact that the railroads have done their best to prevent the river from being used. In addition to this, however, and perhaps even more important, is the fact that the use of the Mississippi involves much trans-shipment. Suppose a farmer lives anywhere in the Mississippi Basin and is shipping wheat to the East by rail. He hauls it to the railroad by truck or wagon. There it is transferred to a grain elevator and then shot into a freight car. The car can go straight to some inland eastern city where the wheat is made into flour or breakfast food and sold locally. The freight charges are high, but there are only two trans-shipments between the farmer and the local dealer.

Wheat shipped by the Mississippi River is not only much longer on the way and hence more likely to be spoiled than if sent by rail, but it requires three extra trans-shipments and perhaps six. First, after a journey by rail it must be transferred to the Mississippi boat, but if no boat is on hand when the car arrives, the wheat goes to a grain elevator for later trans-shipment to the boat. At New Orleans it is again trans-shipped from the river boat to the ocean steamship either directly or by way of an elevator. Arriving at New York or Boston it must be transferred from the ship to an elevator and then to a freight car to be carried to its inland destination. In shipping grain directly to Europe, the use of the great river would undoubtedly save expense. But so much of the food from the West is consumed in the eastern United States that the shippers plan mainly for that. The frequent trans-shipments, the length of the water journey and the relatively poor and infrequent service of the river boats prevent people from acquiring the habit of using the great Mississippi water route.

In Europe the necessity for trans-shipment is one reason why Britain surpasses most of continental Europe in transoceanic commerce. Since all foreign imports must be loaded upon ships even if only to cross the English Channel, the extra cost of bringing goods across the ocean often adds relatively little to their price. On the continent the use of different railroad gauges causes a vexatious trans-shipment problem at some international boundaries. Russia has a gauge of 5 feet and Spain and Portugal of 5 feet $5\frac{3}{4}$ inches. The other European countries generally use the standard gauge of 4 feet $8\frac{1}{2}$ inches, although some French and other lines have a 4-foot 9-inch gauge. Originally many European countries deliberately adopted unusual gauges in order to make invasion difficult in time of war.

In the United States one of the greatest trans-shipment problems arises from the fact that the heart of New York City is located on the island of Manhattan. This has much to do with the fact that over 10,000 harbor-craft, lighters, and ferry boats are employed in New York harbor. A tunnel under the Hudson River for motor traffic helps the railroad tunnels, but New York still has serious trans-shipment difficulties.

(5) *Resources and Railroads.*—In the newer parts of the world, especially in the western United States, many railroads were built through regions with almost no population. Their purpose was to connect centers of population with regions where agricultural possibilities or mineral ores promised wealth provided there were transportation. Such railroads usually penetrate territory where an active population can live permanently, as in Kansas and along the Canadian

Pacific, and hence are a permanent success. Other examples are certain little lines built to open up coffee or fruit regions in South America. The winding railroads of the Kentucky mountains, built to bring out coal, illustrate how numerous such railways may be, and how poorly they may satisfy the needs of ordinary transportation.

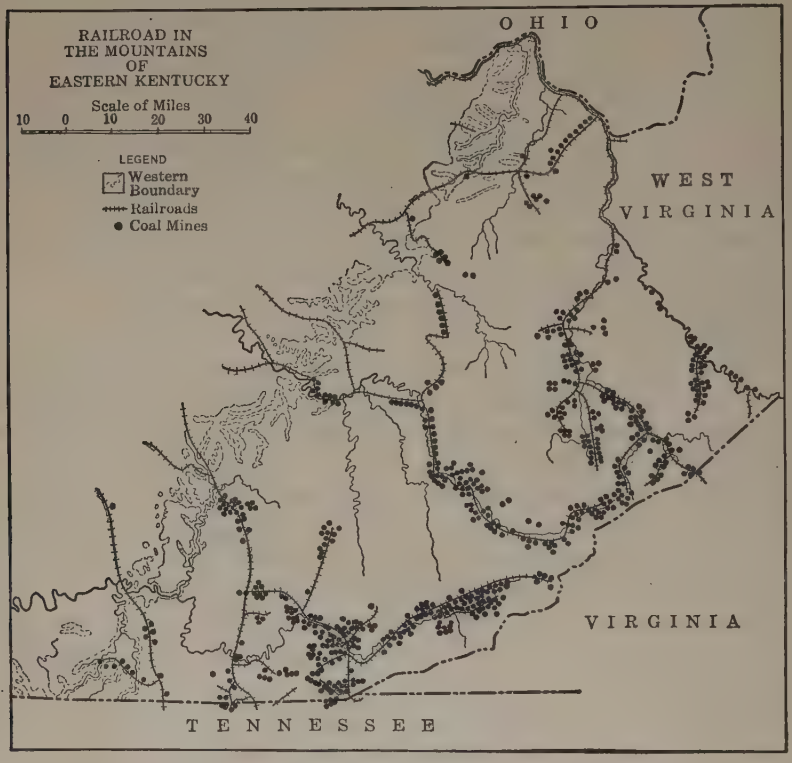


Fig. 60.

The Distribution of Types of Transportation.—The main methods of transportation are (1) man power, (2) horses or other animals, (3) trolley lines or other light railways, (4) ordinary railways, (5) motor vehicles, (6) water-craft, (7) air-craft. In most of the world's great cities each of these types, except the last, plays an important part, but in minor cities and rural districts only one or two are sometimes employed. Even in great cities their relative importance varies greatly.

(1) *Man Power.*—In spite of recent mechanical progress, man power is still the most universal of all types of transportation. In places like Chicago, New York, Liverpool, and Hamburg, almost every article of commerce is moved at least a few feet by human muscles. Iron

russes and a few such articles may be moved wholly by machinery, ut they are the exceptions. Bricks, pianos, newspapers, milk, and egetables suggest the enormous diversity of the things that are always arried at least a short distance by hand. The difference between coun- ries with backward and advanced methods of transportation does not e in the *number* of articles that are carried by hand, but in the *length* f the journeys performed in that way, and also in the extent to which eople as well as goods are thus carried. The maximum use of man ower, for long journeys as well as short, occurs in places like central frica and the Himalayas where the stage of civilization is low, the popu- tion is sparse, and animals cannot be used because of insect pests, oor food, deep snow, or other causes. China, Japan, India, and the lateaus of Latin America where Indians trot to market with produce n their heads, represent types of regions where human muscles play a redominating part in transportation except for long distances.

(2) *Animals for Transportation.*—Animals are still the main reliance or transportation in a far larger part of the world than is often realized. he area in which they are the main means of transporting both goods nd people locally may constitute 90 or 95 per cent of the inhabited arth. It embraces the major part of most of the continents, including ven the southern United States and the more rugged rural areas all ne way from Maine to California, for there the roads are generally ad and the people poor. Only in the remainder of the United States nd in limited parts of a few countries like Canada, Australia, and Eng- nd have motor vehicles supplanted horses as the main means of local ransportation. Even in the cities of the northern United States there re large down-town areas where slow traffic and frequent stops cause orse-drawn vehicles to be more numerous and less expensive than rucks. Moreover, on the vast majority of American farms, and on ractically all farms elsewhere, the work that is not done by people is one by animals. It sometimes seems to the average American that ne horse now finds his chief use in carrying small loads short distances n cities, in working on farms where tractors cannot be used, and in act- ng as the means of transportation in sparsely settled and backward egions. As a matter of fact, the horse is still the main means of local ransportation, as well as of farm work, in all advanced countries except nose that speak English, and in large sections of the English-speaking ountries.

(3) *Trolley Lines and Light Railways.*—Trolley cars are like horses n showing a marked concentration in cities, but quite unlike them in eing rarely found elsewhere. They find their chief field in transporting ne dense population of industrial centers where great numbers of people annot afford automobiles even in rich countries like America. The

intensity of manufacturing, as shown in Figs. 141 and 142, is a fairly good index of the extent to which trolley lines are developed. For example, if the states be divided into eight groups (A–H) on the basis of the percentage of their working population engaged in manufacturing in 1920, the average number of miles of trolley lines per 1000 square miles works out as follows:

Percentage of Population Engaged in Manufacturing	Miles of Trolley Tracks per 1000 Square Miles	Percentage of Population Engaged in Manufacturing	Miles of Trolley Tracks per 1000 Square Miles
A. 51	204.7	E. 21	8.1
B. 39	53.9	F. 18	4.7
C. 32	28.3	G. 16	5.8
D. 25	10.3	H. 12	1.8

Interurban trolley lines, which are most numerous in the relatively level and well-populated prairie states from Ohio to northern Illinois, assume almost the character of railroads. Quite a different type of light railway is found in the very light tracks, often only 18 inches wide, which are characteristic of tropical plantations. One finds them especially in sugar plantations, but also in those where bananas and other crops are raised. Often the little open freight cars are pushed by hand, but gasoline motors are common. In many cases the tracks are taken up and moved from one part of the plantation to another as the crop is harvested. Similar light railways are characteristic of mines, where they are used to bring the ore to the shafts, and to take it from the mouths of the shafts to the mills.

(4) *Relative Importance of Railways.*—The local distribution of railways depends largely upon the conditions of relief and upon the location of harbors, commercial centers, mines, and other familiar conditions. The general distribution, however, is essentially the same as that of civilization and progress. Nevertheless, in regions where transportation is most highly developed, the relative importance of railways has appreciably diminished. First the trolley lines took from them much local business—passengers and then freight. Next the automobile did the same thing for both railways and trolley lines, but on a larger scale. The airplane may perhaps do likewise some day. In no country, however, does the railway show much sign of losing its place as the main carrier of freight and passengers for long distances. Nevertheless, there are many indications that the newer and likewise the less developed parts of the world will never have such dense railway

nets as have the parts now most advanced and well populated; for automobiles, motor buses, trucks, and airplanes will take their place. In Australia, for example, the Government is committed to the scheme of building an extremely expensive railroad across the center of the country from south to north through the great desert. But the same end can be achieved by a good automobile road and an air route. Hence many people believe that this railway, and many others now under discussion, will never be finished.

(5) *Local Distribution of Motor Transport.*—The world-wide distribution of automobiles has been considered in connection with sources of power. The local distribution depends largely on the fact that highly prosperous people and good roads are both necessary if motor cars are to be used on a large scale. Hence the most strongly developed automobile regions include the outer and more prosperous suburbs of cities, the most prosperous farming regions, and general areas like California where the processes discussed in previous chapters have concentrated an unusually competent and prosperous population. The motor truck is to-day the freight carrier of the great cities and of the prosperous farms, but it is fast becoming also the freight carrier of sparsely settled regions where there are not enough people or products to make it pay to build railways, as in the drier parts of the United States, Australia, Mesopotamia, Sudan, and the Sahara.

(6) *Water-Craft.*—The main routes for water-craft, as already indicated, run east and west between great centers of production (Fig. 1). A secondary but important series connects these main centers of activity with tropical regions like Cuba, India, and Java, where the population is dense enough to produce a good deal that is wanted by non-tropical people, even though the production per capita is small. Another type of water-borne craft plays a large part in transportation in certain areas where level plains are crossed by silt-laden streams which deposit their silt and hence break up into many channels. If rice is a main crop in such a region, so that people are obliged to construct artificial waterways to all parts of the plain, there may come into existence a network of small waterways comparable to the network of railways or even of roads in a state like Michigan. Such conditions exist on a small scale in parts of Japan, Chosen, India, and Siam, and on a vast scale in China. In the flatter coastal parts of China a network of canals often brings all the little villages of a large area into easy communication by means of boats rowed by hand or propelled by the wind. Such a network almost excludes every other means of transportation except man power, for not only does it provide very cheap and efficient transportation, but it makes the construction of roads and railroads

very expensive by reason of innumerable bridges. The lowlands of Europe, especially Germany and the Netherlands, provide another notable example of the use of watercraft on canals and rivers.

(7) *Air-Craft.*—The distribution of air-craft, even more than of automobiles, is sharply limited to a few of the most progressive and prosperous regions, especially the great cities. The craft may indeed fly to all parts of the world, but they serve only the richest and most advanced types of people and regions.

A Summary of Transportation Facilities in the United States.—Let us now examine Fig. 61, which attempts to combine all the main

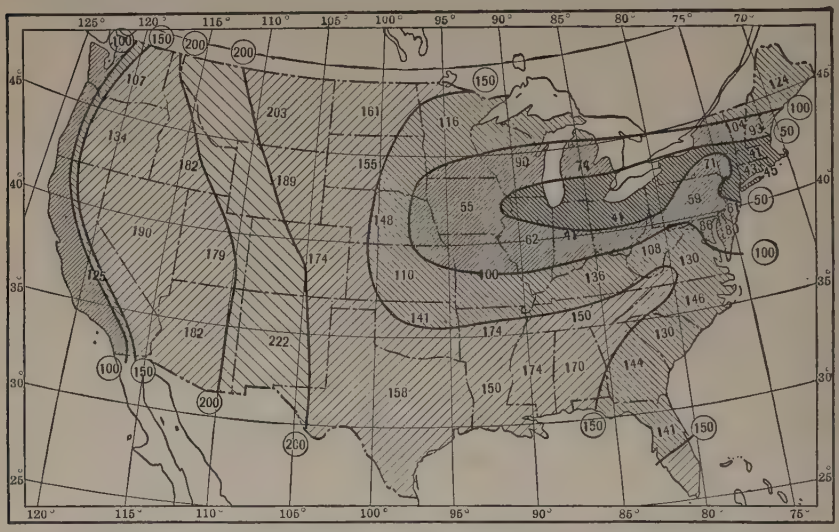


FIG. 61.—Transportation Facilities in the United States.

Based on railways, trolley lines, and rural roads per square mile, expenditure per mile of road (1914–1923), and automobiles per capita.

facilities for transportation in different parts of the United States. In constructing this map the states were ranked from 1 to 48 according to their position in each of the following respects: (*a*) railway mileage per square mile, (*b*) trolley mileage per square mile, (*c*) rural roads per square mile, (*d*) expenditure per mile of rural roads, 1914-1923, (*e*) automobiles per capita. The sum of the ranks in these five respects appears in Fig. 61. It gives an excellent idea of the general ease with which transportation is possible in different parts of the country. The most impressive features of this map are, first, its resemblance to the maps of progress (Fig. 45), health (Fig. 46), and climatic energy (Fig. 43); and second, the strongly accentuated effect of the Appalachian

Mountains and especially of the western cordillera in retarding transportation.

Data for similar maps of the rest of the world are not available, but such facts as are known make it almost certain that a transportation map of the world would be closely similar to the corresponding maps of climatic energy, health, and progress, except for a marked accentuation of the effects of relief. In other words, our main conclusion is that while the local distribution of facilities for transportation depends largely upon relief, the broader distribution is mainly dependent upon the various factors which make people energetic and productive. It is far easier to reach a point 100 miles from Zermatt, for example, in the center of the Alps, than to travel over the plain 100 miles from the center of the Sahara, Arabia, northern Canada, northern Siberia, the Amazon Valley, or Central Africa. In the one case good roads, railroads, motor vehicles, and even airplanes are readily available; in the others not even good trails are available, and there are practically no public facilities for transportation even where there are people.

Nature of Contrast between Progressive and Backward Transportation Systems.—Such contrasts as that between Switzerland and Central Africa emphasize a geographical principle which has already been stated in another connection: Each advance in human power and knowledge tends to increase the contrast between the parts of the world having favorable and unfavorable environments. In the field of transportation this contrast manifests itself in an increasing tendency toward the four following conditions in the highly favored parts of the world: (1) greater specialization and limitation; (2) greater power, speed, endurance, and load-carrying capacity; (3) greater danger; and (4) a greater demand for high mental ability. Since backward regions suffer no such tendencies, the contrast between the two types seems bound to increase indefinitely.

Consider how highly specialized our transportation really is. We use not only railways, steamships, automobiles, trolley cars, and airplanes, but cash carriers, pneumatic chutes, elevators, dredges, and traveling cranes. We travel not only on the surface of the ground, but under it and in the air. In large parts of central Africa and New Guinea, on the contrary, practically all transportation, now, as always, is carried on by men's own hands, backs, and heads. But there is no gain without some loss. A huge modern city like Chicago, or even Philadelphia, is peculiarly at the mercy of nature because it relies so much on artificial means of transportation. A heavy snow storm may put practically every automobile, trolley car, and train out of commission and inflict no end of suffering upon people who actually cannot

get such necessities as milk. Communities that rely on their own muscles for transportation never suffer such disasters.

The advanced regions differ from the backward regions not only in the complexity of their methods of transportation, but in their scale. Perhaps the most notable combination of speed, endurance, and carrying capacity is the great ocean liner which can carry 30,000 tons of cargo besides 3000 passengers at the rate of 25 miles an hour for 10,000 miles without stopping. Suppose the same load were carried an equal distance by land on men's backs, each man carrying 100 pounds and walking 20 miles a day. The 3000 passengers on the steamship could do the work in 274 years without interruption for Sundays and holidays. Yet 500 men could handle such a ship if she carried only freight. The work of each man in the crew results in as much transportation as would the work of 36,000 men carrying loads on their backs.

But each new type of transportation and each improvement in speed brings new dangers to life and limb. During recent years in the United States the number of accidents due to transportation has increased ominously. For example in 1900, when an automobile was almost a curiosity, the deaths from accidents and injuries due to vehicles on the roads in the registration area of the United States numbered 1.3 per 100,000 persons. In 1922 the corresponding rate for horse-drawn vehicles was 1.5, or practically the same, but to this were added the following : street cars 1.6, airplanes 0.2, and motor vehicles 12.8. In California, where automobiles are most numerous per capita, the death rate per 100,000 from automobile accidents actually rose to 26.0 in 1922, whereas in England, where automobiles are relatively scarce, the rate was only 4.0. If we add to our automobile deaths a rate of 6.1 for deaths due to railroad accidents, and add also the crimes which are possible because of the automobile, it is evident that countries which adopt the most advanced methods of transportation also saddle themselves with a terrible load of misery. In proportion to the number of people who use the airplane, that mode of conveyance is by far the most dangerous yet invented.

This introduces another great contrast between progressive and backward countries. Each step of progress demands higher mentality. The most stupid man can carry a load almost as well as the most competent. But a locomotive demands an engineer of alertness and good judgment; a great steamship needs a highly competent captain. The automobile does not demand so much skill and judgment as a train or steamship, but highly nervous people or those with what the psychologists call a slow reaction-time do not make safe drivers. It is said that outside of regions inhabited by people of European origin, and perhaps

by Japanese, it is not easy to find men whose reactions are quick enough to make them safe aviators.

The management of modern transportation systems demands much higher mental types than does the actual operation. A rather ordinary man can plan the schedule of a stage coach, manage its finances, care for the horses, and do the driving. Only a man of uncommon ability can wisely manage a great railroad with its thousands of employees, its intricate relations with business, its delicate financial adjustments, its keen competition from trolley cars and trucks, and its need of keeping abreast not only of mechanical improvements all over the world, but of the rapidly changing political and business conditions. The necessity for men of unusual capacity not only as engineers, conductors, and repairmen, but especially to plan schedules, meet emergencies, and plan for the future, throws the more responsible railroad positions in large parts of the world into the hands of the European races. It also produces a situation which emphasizes the difference between advanced and backward countries still more strongly. Because advanced nations have developed such things as modern transportation, modern industry, and the other concomitants of a highly developed civilization, their demand for men of unusual ability is constantly increasing. In backward countries, or the contrary, there is little or no danger that there will be a dearth of men able to maintain the simple economic, industrial, and social systems which there prevail.

The Great Limitations of Modern Transportation.—Modern transportation is a powerful factor in increasing the contrasts not only between the progressive and backward parts of the world as a whole, but between the neighboring portions of the progressive parts themselves. This is because modern transportation is far less competent than the primitive types to serve all parts of a country equally well. So long as people transport everything by hand or on the backs of animals, they can go practically anywhere and carry their transportable goods with them. Of course it is harder to climb a rough mountain side with no trail than to follow a smooth trail on a level plain, but it can be done. But modern means of transportation are extremely limited in their range of operation. Trains and trolley cars must go on tracks, and can conveniently discharge freight only at stations. The curves and grades of the track set limits to the size and speed of trains and to the amount that can be accomplished with a given expenditure of power and labor.

The steamship can go anywhere over the broad ocean but demands elaborate terminal facilities which can be profitably built only where harbors exist by nature or are constructed by man. Ships are not limited in size by difficulties of construction so much as by shallow channels

and inadequate docks. Even at a great port like Liverpool, the fact that large ships must wait outside the harbor until the tide rises high enough to provide a deep channel costs hundreds of thousands of dollars each year. Moreover. ships are almost useless unless supplemented by land transportation.

The automobile and motor truck travel more freely than the train or trolley car, but are greatly limited by the roads. Motor roads are often almost as distinct as railroads; if a road falls below a certain standard of smoothness and hardness its motor traffic is limited, the expense for repairs on cars mounts up enormously, and the size of the loads and the speed of locomotion fall correspondingly. Out West this limitation is locally recognized when people speak of 10-mile, 15-mile, or 30-mile roads, depending on how fast an automobile can traverse them. But there are also 5-mile roads, on which the use of automobiles is prohibitively expensive, even if an occasional car may traverse them.

At first thought the airplane seems free to travel anywhere, but its freedom is limited to the air. As soon as it tries to land, it requires a large area and very special conditions. A few years ago, people hoped that the airplane would solve the problem of the person remote from civilization, the distant miner, planter, or cattle rancher, too far away and isolated to have the advantage of good roads. Only a little of the kind yet appears to be happening. On the contrary, the use of airplanes is mainly limited to large centers where expensive landing fields are available. The airplane, like all other improvements in transportation, illustrates the fact that each new and more highly specialized improvement tends to concentrate its advantages in the places that are already large enough, rich enough, intelligent enough, and competent enough to profit by them.

Because of all these conditions, large areas, even in the most advanced regions, are relatively much worse off for transportation to-day than they were fifty years ago when there were no motor cars, trolley cars, or concrete roads. At that time the farmer among the rugged Catskills, Berkshire Hills, or Ozarks, or in the Allegheny Plateau may have had to drive over a very rough road to get to the market town 30 miles away, but he could at least haul half as much as could his neighbor 30 miles from town in the other direction across the level but muddy plain. To-day it is different. The hill farmer still hauls his produce in the same old way and in the same old amounts; the farmer in the plain now has to haul his only 5 miles because a railroad has been built; and he can haul ten times as much as the other because he has a motor truck and can use a concrete road. Having only a sixth as far to go and having ten times as large a load he is now sixty times as favored as the other

so far as transportation is concerned, whereas formerly he was only twice as favored. Thus the effects of relief, soil, climate, vegetation, sparsity of population, and any other factors which hinder transportation tend to become more and more accentuated, and to increase the contrasts between more favored and less favored regions only a few miles apart. The growth of civilization may increase rather than diminish the power of geographical environment to cause one place to differ from another.

The Distribution of Good Roads.—So far as we can see now, the most feasible way to check this growing contrast between places with

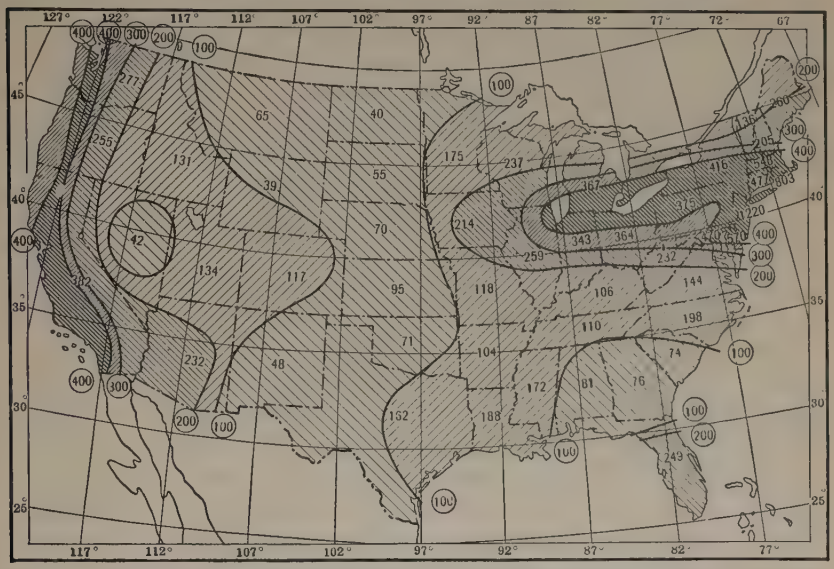


FIG. 62.—Annual Expenditure per Mile on Rural Roads, 1914, 1916–19, 1921–23.

good and poor transportation is by building good roads. Practically everyone lives on a road of some kind; if all roads were equally good, a considerable share of the disadvantages of tens of millions of people who live on farms and in small villages would be removed. The facts as to the present condition of the roads are summed up in Fig. 62. The average expenditure per mile during ten years on roads outside the cities is there used as the best criterion of how well the roads are taken care of. In this map, as in so many others, the most noteworthy feature is the area of good conditions in the northern United States east of the Mississippi, the similar area on the Pacific Coast, the decline southward, and the low area in the semi-arid western part of the Great Plains and in the western cordillera. The resemblance of this map to those of climate (Fig. 43), health (Fig. 46), and progress (Fig. 45) is obvious.

Relation of Transportation and Communication.—Rapid and exact communication is as important as rapid and safe transportation. The two have grown up together and can scarcely be separated. On the whole, however, communication is farther advanced than transportation, for it is less hampered by geographical conditions. A mail route can be established among mountains where a railroad or even a good automobile route would be too expensive because of the sparsity of population. Even where the mails are carried by very primitive modes of transportation such as dog teams and reindeer in Alaska, pack horses in Asia Minor, and yaks among the Himalayas, the regulations as to the care and cost of the mail service are almost as highly developed as in places where express trains are used. It is a noteworthy fact that in backward countries like Turkey, the mail service is safer and more like similar services in advanced countries than almost any other work of the government. Of course the mail may arrive only once a week on the Yukon or once a month in Persia, but even in such remote places the mail is an international matter, and is regulated by strict agreements identical in all countries.

What is true of the mail is largely true of the telegraph. Geographical conditions interfere relatively little with telegraph and telephone lines. Of course it is more expensive to lay a cable under the Atlantic or run a wire across the Caucasus than to string a hundred wires across Indiana where the plain is level and wood for poles can be had not far away. Nevertheless, when the cable or wire is once laid, the interruptions to telegraphic or telephonic communication by wind and storm are far less important than the interruptions to transportation in the same regions.

The wireless telegraph and telephone reduce the importance of geographical conditions almost to the vanishing point. Except for the temporary interruptions by electrical storms or by atmospheric disturbances, which occur by day much more than by night, an explorer in the forests of Africa or the great desert of Arabia can communicate with the rest of the world with comparative ease at almost any time. The whole country may know the very day when an Arctic explorer turns toward home. The one thing that is lacking in order to make communication practically perfect is the ability to see the face of the person who is talking, but even in that direction the first steps have been taken. To sum up the whole matter, modern communication, unlike transportation, can penetrate anywhere at any time, and can give almost perfect opportunities for the exchange of ideas without being hampered by the need of elaborate terminals and expensive roadways. Terminals are indeed necessary, but are relatively small so that they can be set up almost anywhere.

In spite of all this, the actual distribution of telephones and wireless sets in the United States and Canada (Fig. 63) is practically the same as that of improved roads, good transportation facilities, and progress in general. This emphasizes the fact that although geographical surroundings are highly important in their direct effect upon human activities, the controlling factor in causing man's activities to differ from place to place is man himself. It is probable that the indirect effects of geographical environment, through man's health and energy,

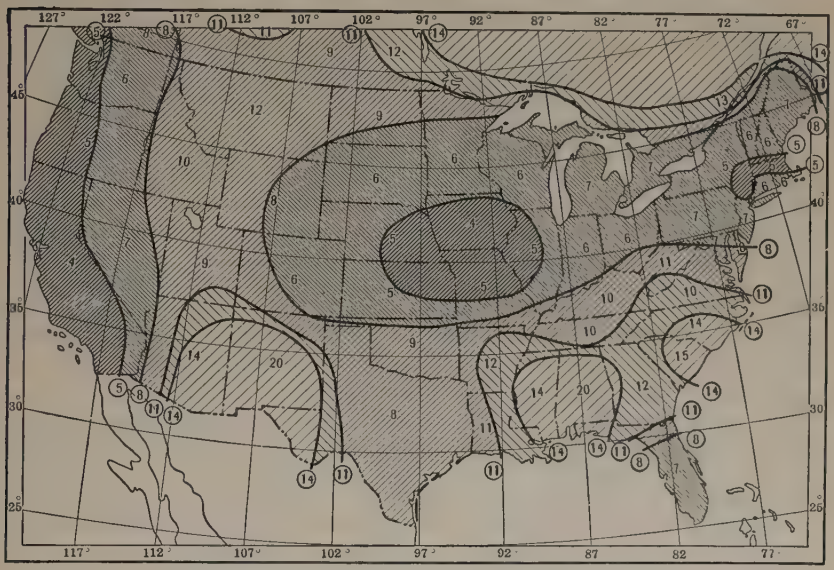


FIG. 63.—White Persons per Telephone in the United States, 1924.

his occupations, and the selection of the type of persons who settle in one place or another, are much more important than the direct effects.

EXERCISES AND PROBLEMS

1. A summary of the distribution of facilities for transportation in the United States. Make a table showing (*a*) the states which stand first, (*b*) second, and (*c*) third, and (*d*) the rank of your own state in each of the conditions shown in Table 37 and in Fig. 62. Note that in some cases a high figure means first and in others a low figure. In which of the conditions which you thus tabulate does the rank of a state depend largely on its area or on its large population? In what other conditions does high rank depend largely on the position of a sparsely populated state between more important centers of population? Explain how this causes certain states to appear to be unusually well supplied with transportation facilities even though they

are states where one must sometimes travel a hundred miles by road or even a score of miles on horseback in order to reach certain portions.

When all these conditions are eliminated there remain five conditions which are especially good evidence as to the ease with which people can reach all parts of a state either in person or with messages. What are these five? Shade a map of the United States as follows: (*a*) heavily, any states that appear three times as ranking first, second, or third in any of these five conditions, (*b*) moderately, those appearing twice, and (*c*) lightly, those appearing once. In which of these states would the density of the shading be increased if we were to include transportation by water among the conditions mentioned above? In order to judge of this consider length of coastline compared with the area of the state, number of good harbors, and inland waterways including lakes, navigable rivers, and canals.

What northern or southern states are shaded on your map? What states would have to be shaded in order to have a complete band cross the country? How do they rank and why are they missing? Explain how your map shows the effect of (*a*) relief, (*b*) density of population, (*c*) other geographic factors.

2. Make a table like that of Exercise 1, except that you use the three states standing lowest in facilities for transportation and communication. Above the columns in which you write the names of the states put the numbers 46, 47, 48, the last being the lowest. Where several states have the same figure put them all in. On the map made in Exercise 1, insert three grades of shading for the present table, but use some other color. Explain the physical conditions which especially hamper transportation and communication.

Two states are shaded in both colors on your map. What conditions help to explain why the same states stand high in one of the requisites for a good transportation system and low in a closely allied requisite?

3. Describe the facilities for transportation and communication in your own state. Compare your state with the states which stand highest and lowest in Exercises 1 and 2, respectively. What geographical conditions chiefly help or hinder transportation in your state?

4. Repeat Exercise 1, but instead of the states use the countries of the world as given in Tables 35 and 36. In preparing your final table showing the degree of progress in transportation and communication, use Cols. C, F, and H, Table 33, and B and D, Table 36. Put the rank of the United States in the last column instead of the rank of your own state. What three general regions are shaded on your map? Give as many reasons as possible for their high rank. In what respects does the United States fall farthest below some of the other countries?

5. Compare the transportation facilities of the states that appear in the table prepared in Exercise 1, with the countries in the table of Exercise 4. To do this arrange the three highest countries from Col. C, Table 33, and the three highest states from Col. C, Table 37, in order according to their rank. How do the highest states compare with the highest countries (*a*) in railway mileage per 1000 square miles, (*b*) in area (Table 1), and (*c*) in population (Table 1)? Make a similar comparison between the three highest in each of the following pairs of columns: Table 36, B, and 37, H; Table 36, D, and 37, J.

If data for canals, improved roads, telegraph messages, and coasting vessels were available we should find that several European countries excel any of the states in these respects.

CHAPTER XII

THE GEOGRAPHIC BASIS OF COMMERCE

The Conditions that Create a Surplus.—The world's products generally change hands before being used, and some change hands many times. Such an exchange requires a surplus on one side and a demand on the other. One person, company, or country must have more of something than is needed for immediate use, while someone else must need that particular thing. Let us see how variations in the surplus supply of goods and in the demand cause commercial transactions to vary in kind, number, and quality from one part of the world to another.

Everything that favors production also favors the creation of a surplus. A level plain, fine rich soil, easy access to navigable waters, and a climate with sufficient warmth, moisture, and sunshine, all stimulate the production of most of the vegetable and animal products that enter into the world's food supply and furnish raw materials for manufacturing and commerce. On the other hand, a rugged topography encourages the production of lumber and of crops like fruit and coffee. In conjunction with a dry climate, a rugged topography generally favors the production of metals. These physical conditions, however, including also their effect on transportation, are not the chief factor in producing a surplus. Density of population is also highly important, for if the population is dense enough, even a small surplus per capita may give rise to active trade, as in China. Still more important is the quality of the people, their inherited mental ability, their energy, and their standard of living. This may mean either the people who live in a place permanently, or those who go there because some desirable resource is available. New Guinea's physical advantages might perhaps allow it to raise rice for almost the whole world, together with great quantities of sugar, corn, sago, cocoa, tea, coffee, tobacco, and many other products, but it has no surplus. Its backward people produce almost nothing except what they immediately consume. In Java, however, where the climate is almost the same, the presence of nearly 150,000 Europeans, chiefly Dutch, enables an island smaller than New Guinea to export products worth over half a billion dollars each year. Again, in China

the supplies of unmined coal are estimated at 1100 billion tons, of which 427 billion are anthracite, against only 166 billion or less than one-sixth as much in Great Britian. But until Europeans took the lead, the Chinese mined practically no coal even for local consumption. Vast quantities lay in the rocks, but there was no surplus for business. Even in 1922 the 435,000,000 people of China mined only 21,000,000 tons of coal, one-twelfth as much as Great Britain, and less than one per cent as much per capita.

On the other hand, Norway has almost no mineral wealth; her cool climate greatly limits the crops; deep soil is found only in a few valleys and on a narrow coastal plain; and the rugged topography permits only one acre in 30 to be cultivated. Yet so energetic and capable are the Norwegians that their abundant surplus not only supports an active trade at home, but makes Norwegian exports ten times as valuable as those of Java in proportion to the inhabitants. Again, Alaska never yielded any surplus worth mentioning while it was in the hands of Eskimos, Indians, and even Russians; but from the time when it was bought by the United States until 1920 it yielded a salable surplus worth about a billion dollars. So, too, although New England has no coal, few raw materials, and not nearly enough water power, the capacity of its people causes it to produce an enormous surplus of manufactures.

The Conditions that Create a Demand.—The conditions that create a demand are in one sense the opposite of those that create a surplus. If a region lacks certain natural advantages, it often demands articles which can be produced only with the help of such advantages. The United States demands a vast quantity of bananas and gets them from Central America, for the Central American climate favors banana-growing and that of the United States does not. New England, being too rugged for extensive wheat cultivation, demands wheat from the Western plains, while Germany, having little copper, demands it from places like Arizona and Montana.

In a more important sense the conditions that create a demand are exactly the same as those which create a supply. For example, the fact that coal and iron are scarce in Ceylon does not cause the 4 million people of that island to demand a tenth or perhaps a hundredth as much of those two highly important products as is demanded by a similar number of people in the Netherlands. The thing that counts chiefly in creating a demand, just as in creating a supply, is the mental ability, physical energy, and stage of civilization of a country.

The Character of Foreign Trade in Three Types of Countries.—Most parts of the world fall into one of three types: (1) Backward countries with poorly developed resources, few and simple products,

almost no manufacturing, and a small surplus used to satisfy a demand for a few simple manufactures. (2) Progressive old countries with resources inadequate to the population, but with a great variety of manufactured products which form a surplus whereby the inhabitants satisfy their demand for raw materials, food, and luxuries. (3) Progressive new countries with well-developed resources, a variety of products, little manufacturing, and a large and varied but unmanufactured surplus which enables the people to satisfy their demand for a great variety of manufactured articles.

Siam is a good example of the first type, Switzerland of the second, and Australia of the third. The United States perhaps belongs in still a fourth class like No. 3 except that manufacturing is highly developed. So far as actual resources are concerned, Siam with 8 million people ought to supply more and demand more than Switzerland with 4 million. The area of Siam is 195,000 square miles, that of Switzerland only 16,000. Siam has a far more productive climate than Switzerland, vastly greater plains, and excellent deposits of tin and other minerals, whereas Switzerland has practically none. If the people of Siam and Switzerland were of exactly equal ability, these conditions might cause the trade of Siam to be at least double that of Switzerland. But Siam does not import a single product to the value of one dollar per inhabitant each year, and only five products to the extent of ten cents or more per inhabitant. Switzerland, on the contrary, imports twenty products to the value of at least one dollar per person, and many others to the extent of at least ten cents.

The extraordinary difference between Siam and Switzerland is largely due to the character and civilization of the people. Distance has something to do with it, but not much, for in proportion to the population the list of imports into Australia, one of the most distant parts of the world, is as imposing as into Switzerland.

Marked contrasts appear not only in the amounts but in the kinds of goods imported into Siam, Switzerland, and Australia. The Siamese imports consist of manufactured goods of a simple nature and few kinds; the Swiss imports include food, raw materials, and manufactures; those of Australia, aside from tobacco, tea, timber, and some rubber, include little except manufactured goods, although these are very varied. These are the normal imports of the three types of countries mentioned above, namely: (1) an old, fairly well populated but undeveloped country where people have little energy; (2) a small, old, densely populated country lying near the center of civilization and having few natural resources; (3) a large, new, energetic, and sparsely populated country far from other civilized regions. The differences between these

various countries, like many other facts, show that the activity of the people is the chief determinant of the *amount* of trade, but the natural resources, the position, and the stage of development determine the *kind* of trade. The distinction between the amount and the kind is important.

In exports, as in imports, Siam, Australia, and Switzerland afford an important contrast. Siam, with two exports of a very simple kind, illustrates the lowest stage. In spite of great natural resources, the Siamese do not work hard enough or use sufficient judgment and skill to produce a large surplus of anything except rice, their main article of food, and teak, their most marketable tree. The small size of their surplus, quite as much as the moderate nature of their desires, limits the size of their trade. In Australia, as in Siam, the exports are almost entirely different from the imports. That is the natural condition in a new country which has abundant resources. The easiest and quickest source of wealth is found in raising sheep, cattle, wheat, and fruit, and in mining the metals. Therefore there is relatively little manufacturing of the more complex types. But notice that the exports of Australia are much more varied than those of Siam, as befits the greater physical and mental activity of the people and their higher standards of living. In Switzerland, on the other hand, the imports and the exports are largely the same in name but not in form. For instance, silk and cotton goods are imported as thread and exported as fine cloth. The Swiss cannot create a surplus by extracting the natural resources of their country; hence they take raw materials or partly manufactured materials from other countries and add to them their own skill so that the final products usually owe more of their value to manufacturing than to the original materials. Swiss exports, however, are systematically less than the imports because the Swiss have large foreign investments on which interest is paid in the form of goods, and because large numbers of tourists must be taken care of.

The World's Foreign Commerce.—The general distribution of foreign commerce is illustrated in Fig. 64, which shows the total commerce per inhabitant of each country. Foreign commerce and domestic commerce, as well as other kinds of business, generally reach their greatest activity in the places where people have much energy. The main exceptions are a few small areas like Hongkong, the Straits Settlements, and Ceylon. In practically every case, however, such places owe the activity of their commerce largely to the presence of people of European races who generally remain there only temporarily.

The Effect of Size on Foreign Commerce.—Although commerce in general, both external and internal, varies in close harmony with

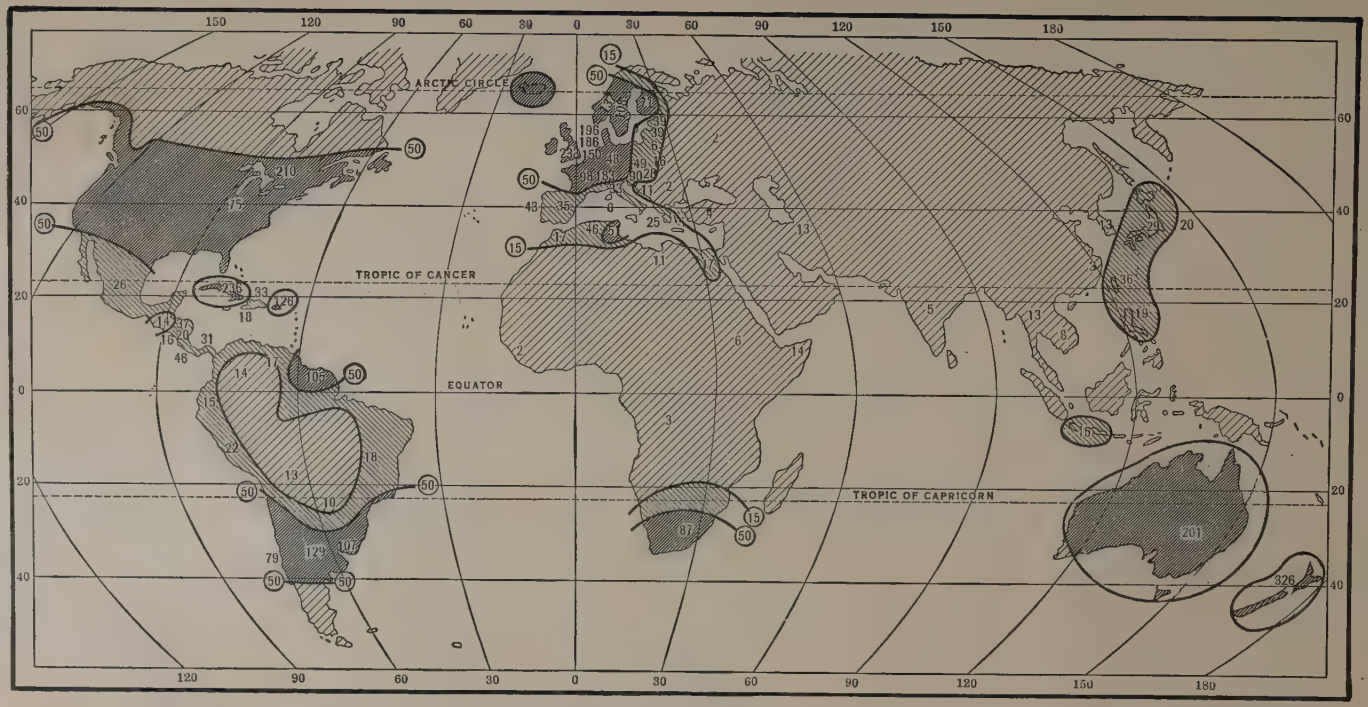


Fig. 64.—World Map of Foreign Commerce per Capita, 1923.

Figures represent dollars per capita when imports and exports are combined.

civilization and productivity, the amount of foreign commerce depends also on other factors which greatly modify its distribution. The chief of these is the size of a country, but position in respect to other countries is also important. The effect of size is evident from the fact that the United States, which is one of the most progressive of all countries, had an average foreign commerce of only $74.50 per capita in 1923 which places it only twentieth among the countries of the world as listed in Table 38. This, of course, is far below its rank in civilization. Cuba, Austria, Argentina, Uruguay, Chile, and even Dutch and British Guiana all stand ahead of it. China, like the United States, stands low in foreign commerce per capita, being fifth from the bottom. Such places as Paraguay, Haiti, Formosa, and Portuguese Africa stand well above it, although certainly their civilization cannot rival that of China. Again, before the Great War, when Russia had long been at peace, its annual foreign trade of $8.56 per capita put it lower than Serbia, which at that time averaged $9.69, Paraguay $11.16, Bulgaria $15.37, and Rumania $33.63.

Thus the per capita foreign trade of a small or sparsely populated country, or of one with no great variety of occupations, is almost certain to be larger than that of an equally progressive, large or populous country with a great variety of products. For example, the United States, China, and Russia, being large, populous countries with varied resources, stand relatively low compared with such small countries as Cuba, Denmark, New Zealand, and Porto Rico. Again, in Europe the little countries of the Netherlands, Belgium, and Switzerland all have more foreign commerce per capita than the larger countries of Russia, France, and Germany. Yet in the large countries business is quite as active as in the small countries.

The reason for this seeming contradiction between the foreign trade of large and small countries can easily be understood from two examples. Suppose that the Netherlands and Belgium should unite. The domestic trade within their area would probably increase, but their combined foreign trade would be less than their trade when separate, because all the goods which now pass across the border between Belgium and the Netherlands, and which are reckoned as part of the foreign trade of each country, would be classed as domestic commerce. In the same way, because Cuba devotes itself largely to sugar and tobacco, it relies on the United States not only for manufactured goods but for food for its sugar raisers. Moreover, Cuban exports are greatly favored by the fact that the United States admits Cuban raw sugar at a preferential tariff rate. Hence Cuba has more foreign trade per capita than the United States. Now suppose the United States were divided into several countries so that the manufactures of the northeast were exported

to the prairie states in exchange for food, to the South in exchange for cotton, and to California in exchange for fruit and winter vegetables. The per capita foreign commerce of these new countries would rise far above that of the present United States. Hence, we conclude that while the foreign trade of a country is an index of its progressiveness, careful allowance must be made for the fact that a large country, especially if its products are varied, does not have so great a trade per capita as an equally progressive small country, especially if the small country produces only one or two main products of great importance to other countries.

Conditions that Promote an Active Exchange of Products.—Let us now sum up all the main conditions that lead to an active exchange of products, no matter whether the exchange be between foreign countries or different parts of the same country. The chief of these are as follows:

(1) *National or Racial Character.*—This depends on inheritance, health, and energy, and is one of the chief causes of the supremacy of northwestern Europe, the United States, Canada, New Zealand, Australia, and Japan in commerce and other kinds of business.

(2) *Diversity of Products.*—This is determined largely by climate and mineral resources, but also by relief and soil. Tropical countries owe most of their trade to the fact that their products differ from those of temperate regions. Venezuela and India, for example, would have little foreign trade if people from other climates in the United States and Europe did not come to them for products that are found mainly within the tropics. Nevertheless, the fact that the two tropical countries have products different from those of the northern regions may in the future stimulate trade far more than at present.

(3) *Distance* is also highly important in determining the amount of trade between two regions. We might get from the East Indies all the products that we get from the West Indies, but we actually get relatively little. It would scarcely pay to carry products five to seven thousand miles when we need to carry them only one to three thousand. It should be noted, however, that distance is a purely relative matter. It is easier to carry goods 7000 miles by sea where lines of communication are already established than 100 miles across mountains with no roads.

(4) *Language, Customs, and Government* likewise play a great part in foreign trade. As for language, everyone prefers to do business with someone whom he can understand. Hence, while Portugal does only a negligible business with the rest of South America, a fifth of all her exports go to the Portuguese-speaking country of Brazil. An astonishingly small custom will prevent trade even among highly civilized people. For example, the British buy a good deal of American salt pork. But

the pork must be salted with British salt. American salt leaves an insoluble white residue on the meat. This does no harm and Americans rather like it, but the British object. Hence, in order to maintain a profitable British trade, the packer must import British salt which is absorbed completely by the pork. The *form* of government makes little difference: a republic is good in Switzerland, bad in Ecuador; a constitutional monarchy is good in Britain, bad in Persia. The *character* of a government is what counts, and that depends largely on the character of the people. A wise government can greatly increase trade by making proper laws as to taxes, shipping, and commercial intercourse. Many people think that Great Britain owes much of her foreign commerce to her policy of free trade, while others think that a protective tariff has stimulated domestic trade in the United States. Both points are disputed, but almost everyone agrees that when backward people are governed and directed by those who are more progressive, trade is usually much stimulated. If India, the Philippines, and especially the Guianas had never been under foreign governments, their positions in the table of foreign trade per capita would be much lower than at present. In fact, they would almost disappear.

The Ideal Conditions for Active Exchange of Products.—Ideally, the conditions most favorable to active business between two regions are as follows: (*A*) Both should be inhabited by people of high mental capacity and of as great energy as is consistent with the climate. (*B*) The two regions should be quite different in climate so that one, for example, produces cereals, beef, mutton, hides, wool, soft wood, and other products of the temperate zone, while the other produces sugar, coffee, rubber, tropical fruits, spices, hard wood, fibers like manila hemp, and other tropical products. (*C*) At the same time, the cooler country should have plenty of coal, petroleum, and water power so that manufacturing is stimulated; while the other should produce all sorts of metallic ores, especially iron, which can readily be taken by sea to the coal of the other country. The cool country should also produce mineral fertilizers which are chiefly needed in the warmer country. (*D*) The countries should lie as close together as is consistent with a pronounced climatic difference, and should be connected by a sea, both coasts of which have been submerged so as to provide many deep indentations and good harbors. Thus transportation will be as easy as possible. (*E*) Both countries should be under the same government, and the government should be wise, honest, and progressive. (*G*) The people in both regions should speak the same language and should be as similar as possible in ideals and habits so that they will understand one another's preferences and peculiarities.

The eastern United States and Cuba; England and Ceylon; the Netherlands and Java; and Belgium and Belgian Congo are pairs of countries which approach the conditions most favorable for trade. All fall far short of the ideal here described, but the United States and Cuba approach it most closely. In spite of their differences in racial character, government, language, and customs, their nearness and the fact that they have almost the right degree of difference of climate, plus the activity of the United States, causes the per capita trade of the Cubans with the United States to be exceeded only by that which the Dutch are able to carry on with the Germans because they hold the mouth of the Rhine. Everywhere the activity with which any two regions carry on the exchange of products and services can be largely explained by the five factors here considered, namely, racial character, diversity of products, government, transportation, and language and customs.

EXERCISES AND PROBLEMS

1. Divide the class into groups to investigate the demands of your state and others in comparison with their production and surplus. Base your estimate of the demands on the following lines of investigation. (*A*) In the state assigned to you compare the percentages of the gainfully occupied population engaged in agriculture, mining, and manufacturing with the similar data for the whole U. S. (Table 8). Assume that the percentages in Table 8 for the whole country represent about the necessary proportions of the three occupational classes which actually produce goods. In what respects is your state weak?

(*B*) In the U. S. as a whole about 60 farms and 5000 acres of improved land supply the needs of 1000 people. From the Abstract of the Census ascertain how these figures compare with those of the state you are working on. Table 16 shows how the average total yield of all crops per acre varies from state to state. What difference does this make in your estimate of the amount of improved land needed to supply the needs of your state?

(*C*) The following table shows the approximate annual consumption of certain main products per capita in the United States, and the number of animals, or area of land necessary to supply certain other needs such as animal food (1919 and 1920).

Corn	27 lb.	Cotton	30 lb.	Lead	10 lb.
Oats	10 bu.	Wool	7 lb.	Copper	8 lb.
Wheat	7 bu.	Rubber	5 lb.	Zinc	7 lb.
Potatoes (all kinds)	4 bu.	Silk	0.3 lb.	Salt	128 lb.
Orchard fruits	2 bu.	Lumber	300 bd. ft.	Manufactures	$590 (Perhaps $400 in 1925)
Vegetables	0.014 acre	Coal:		Horses or mules	0.25
Sugar	92 lb.	anthracite	0.7 ton	Beef cattle	0.34
Grapes	25 lb.	bituminous	3.9 ton	Dairy cattle	0.30
Tobacco	13 lb.	Coke	0.4 ton	Sheep	0.33
Coffee	13 lb.	Petroleum	200 gal.	Swine	0.56
Tea	0.8 lb.	Pig iron	0.3 ton	Chickens	3.5
Peanuts	¼ bu.	Tin plate	24 lb.	Hay and forage	1.4 tons

Calculate the needs of your state for each of the products named above, assuming that the requirements are like the average for the U. S. Compare the state's needs with its production as given in Tables 15, 17, 23, 27 (count 2 tons of iron ore as roughly equal to one ton of pig iron), and 31 (use column K and base your conclusions on an average value of $237 per capita added by manufacturing instead of on $590, the total value of manufactures per capita). Your own general knowledge will give the necessary facts for certain other articles such as rubber.

Complete the work by preparing a table showing (*A*) your state's deficit in the articles which are not produced in sufficient quantities, (*B*) a region of surplus production where your state can easily supply its needs of each article; (*C*) your state's surplus in various articles; and (*D*) an easily accessible region where a demand for each of these articles exists because of a deficit. Explain the geographical causes of the main features of the deficit and surplus in your chosen state.

2. Examine the conditions which determine the variation of prices from place to place. In Tables 16 or 20 choose some product and make a shaded isopleth map of its variations in price from state to state. Make two other maps of the same article from Tables 16 or 18 and 19. Compare the three maps of each product. Try to determine how far prices are influenced by (*A*) abundance of production per capita, (*B*) proximity to great cities and industrial areas, (*C*) transportation and its relation to (*a*) the bulk or weight of the article, (*b*) its fragility, or tendency to spoil rapidly, (*c*) the degree of accessibility of the region of production and its relation to seaports and trunk railways.

3. Contrast the foreign commerce of two distinctly different countries in the same continent, for example Chile and Ecuador. From the Statesman's Yearbook list the exports and state the dominant conditions in each country which allow a surplus to be produced for export. Make a similar study of the imports and state the reasons why they are of a given type. What indications does the foreign trade supply as to which country is more advanced?

4. In Table 38, select the five leading countries in the column "Number of times by which imports exceed exports" and analyze the conditions to which this is due. In the cities listed in Table 39, how commonly do either exports or imports exceed each other by a large ratio? In the case of Harwich, England; Iquique, Chile; and Bilbao, Spain, what explanation can you find?

5. Among the United States Customs Districts in Table 41, Galveston shows a wide divergence between imports and exports. Analyze the city from the standpoint of what is said in the text as to "Conditions which promote an active exchange of products" and "Ideal conditions for active exchange of products."

6. Study the foreign commerce of the United States as given in Tables 40 to 43. (*A*) Draw graphs illustrating the relative values of the chief exports and imports. (*B*) For each of 10 or 15 chief exports prepare a map on which you indicate by appropriate symbols the amount sent from the United States to the more important countries. (*C*) Prepare similar maps of 10 or 15 exports. (*D*) Sum up your conclusions as to the commodities and countries that are most important in the foreign trade of the United States. Suppose that the trade were limited to 10 countries and 10 commodities. What combination of countries and commodities would produce the greatest trade (*A*) in value? (*B*) in tonnage (Table 40)? How would that trade compare with the actual total?

PART II

GREAT PRODUCTS AND TYPICAL COMMUNITIES

CHAPTER XIII

PRINCIPLES OF ANIMAL DISTRIBUTION

Kinds of Domestic Animals.—In the world as a whole, the chief domestic animals yield an annual return of approximately 27 billion dollars when reckoned in American prices. This is nearly half the value of all vegetable products except food for animals; it is twice the value of all the minerals. The accompanying table lists the animals that furnish practically all of this vast value, according to their zoological families. The starred animals may be excluded from further consideration. Most of them represent attempts at domestication which have not proved of much permanent value, or whose ultimate success is not yet known.

The Limitations of Domestication.—Several important features deserve notice in connection with the 30 unstarred animals. (1) All were domesticated so long ago that we have no certain knowledge of the event, in many cases not even a tradition. (2) The number of species that have proved permanently worthy of domestication is extremely small. Among approximately 3500 known species of mammals, only 19 are unstarred above. Among 13,000 species of birds, only 9 fall among our 30 animals, and one of those, the ostrich, may drop out, if its feathers fail to find favor. Reptiles, 3500 species; amphibia, 1400; and fish, 13,000 have no domesticated representatives, except the doubtful goldfish. The case of insects is still more extreme, for silkworms and bees are the only domesticated species out of approximately 470,000. (3) The qualities which make an animal worth domesticating are concentrated in a few small groups. Among the 30 animals here discussed no less than 16 belong to a single group, the *Ungulata* or hoofed mammals. Six of these are species of cattle, all from the genus *Bos*, which contains only 10 species in all. The cattle family, as distinguished from the genus,

TABLE B—THE WORLD'S DOMESTIC ANIMALS *

MAMMALS.

A. Hoofed mammals. (*Ungulata.*)
- I. Order of odd-toed hoofed mammals. (*Perissodactyla.*)
  - *a.* Horse family.
    - 1. Horse. (*Equus caballus.*) Central Asia.
    - 2. Ass. (*Equus africanus.*) North Africa.
- II. Order of even-toed hoofed mammals. (*Artiodactyla.*)
  - *a.* Cattle family.
    - 3. Ordinary cattle. (*Bos primigenius.*) Europe.
    - 4. Humped zebu of India, and galla of Africa. (*Bos indicus.*) India.
    - 5. Gayal. (*Bos frontalis.*) India.
    - 6. Banteng or Javan cattle. (*Bos sondaicus.*) East Indies.
    - 7. Yak. (*Bos grunniens.*) Tibet and Himalayas.
    - 8. Water buffalo. (*Bos babulus.*) India.
    - 9. Sheep. (*Ovis aries.*) Probably Western Asia.
    - 10. Goat. (*Capra hircus.*) Western Asia.
  - *b.* Pig family.
    - 11. Pig. (Perhaps several species.) Europe, Asia.
  - *c.* Camel family.
    - 12. Arabian camel, one-humped. (*Camelus dromedarius.*) Arabia.
    - 13. Bactrian camel, two-humped. (*Camelus bactrianus.*) Central Asia.
    - 14. Llama. (*Llama glama.*) Peru.
    - 15. Alpaca. (*Llama pacos.*) Andes.
  - *d.* Deer family.
    - 16. Reindeer. (*Rangifer tarandus.*) Arctic regions.
- III. Order of elephants. (*Proboscidea.*)
  - *17. Elephant. (*Elephas indicus.*) India. Not bred in captivity.

B. Clawed mammals. (*Unguiculata.*)
- I. Order of flesh-eating mammals. (*Carnivora.*)
  - *a.* Dog family.
    - 18. Dog. (Descended from several species.) Place of origin unknown.
    - *19. Silver fox. (*Vulpes fulvus.*) North America.
  - *b.* Cat family.
    - 20. Cat. (*Felis libyca* and other species.) Probably North Africa.
    - *21. Cheetah. (*Acinonyx jubatus.*) Subtropical Asia and Africa.
  - *c.* Marten family.
    - *22. Ferret. (*Putorius foetidus.*) Probably North Africa.
  - *d.* Civet and mongoose family.
    - *23. Mongoose. (*Herpestes mungo.*) India.
- II. Order of gnawing mammals. (*Rodentia.*)
  - *a.* Rabbit family.
    - 24. Rabbit. (*Oryctolagus cuniculus.*) Western Mediterranean basin.
  - *b.* Rat family.
    - *25. White rat. Probably China, but first domesticated in England about 1850.
    - *26. White mouse. Origin unknown.
  - *c.* Guinea pig family.
    - *27. Guinea pig. (*Cavia cutleri.*) Peruvian coast, originally kept for food.

BIRDS.
- I. Order of fowl-like birds. (*Galliformes.*)
  - 28. Hen. (*Gallus gallus.*) India.
  - 29. Turkey. (*Meleagris mexicana.*) Mexico.
  - 30. Guinea fowl. (Wild stock unknown.) Probably West Africa.
  - 31. Peafowl. (*Pavo cristatus.*) India.
- II. Order of goose-like birds. (*Anseriformes.*)
  - 32. Duck. (*Anas boschas.*) North America, temperate Europe and Asia.
  - 33. Goose. (*Anser anser.*) Northern Europe (?)
  - 34. Swan. (*Cygnus olor.*) Central Europe and Central Asia.
- III. Order of plover-like birds. (*Charadriiformes.*)
  - 35. Pigeon. (*Columba livia.*) Mediterranean region to China.
- IV. Order of ostriches. (*Struthioniformes.*)
  - 36. Ostrich. (*Struthio camelus.*) North Africa.
- V. Order of stork-like birds. (*Ciconiiformes.*)
  - *37. Cormorant. (Several species.) Coast of Europe, Asia, America.
- VI. Order of falcon-like birds. (*Falconiformes.*)
  - *38. Falcon. (Probably several species.) Southern and Eastern Asia.
- VII. Order of sparrow-like birds. (*Passeriformes.*)
  - *39. Canary. (*Serinus canarius.*) Canary Islands and Maderia.

FISH.
- I. Order of the bony fishes. (*Teleostei.*)
  - *40. Gold fish. (*Cyprinus auratus.*) China.

INSECTS.
- I. Order of butterflies and moths. (*Lepidoptera.*)
  - 41. Silkworm. (*Bombyx mori.*) China.
- II. Order of ants, bees, and wasps. (*Hymenoptera.*)
  - 42. Bee. (*Apis*, many species.) Mediterranean region. (?)

* Nomenclature after Hegner. Arranged in the order of their importance to man so far as this is consistent with the zoological classification.

includes also the sheep and goat, so that one-fifth of all the domestic animals, and one-fourth of the important ones, come from this one family. In the same way 4 out of 6 members of the camel family have been domesticated, and 2 out of the 7 members of the horse family. All the more important birds come from two orders, *Galliformes*, and *Anseriformes*.

Uses of Domestic Animals.—Usefulness is the main quality which makes an animal worth domesticating. In a stage of culture like our own, the main uses of domestic animals are: (1) food, (2) transportation, (3) clothing, (4) raw materials other than for clothing, (5) protection, (6) hunting, (7) scavenging, (8) fertilizer. Food is put first because financially it occupies the main place. When reckoned at American prices, the main food products derived from animals are worth the huge sum of nearly 23 billion dollars per year, or about one-third as much as all man's vegetable food (page 6). The world's annual production of animals for transportation has an estimated value of about 2 billion dollars, but the relative importance of animals in this respect is much greater, for animals live many years, whereas food is usually consumed the year it is raised. The wool, silk, and hides supplied by animals provide clothing materials worth another 2 billion dollars each year, although their importance is probably much less than that of the animals for transportation, as will appear below. The next four uses occupy such a minor rank that they are here excluded from further discussion, while the importance of fertilizers has already been discussed.

The Importance of Animals for Transportation.—The use of animals for transportation and draft is probably more important than for food. Without beasts of burden, human beings might never have progressed beyond the stage of carrying all loads with their own bodies, as among the highland Indians of Guatemala. Unless animals had been used to pull the plow, the main centers of agriculture and civilization might never have migrated into regions of forests and prairies where the climate is especially stimulating and the highest civilizations now center. In most such regions a cover of sod soon smothers a field that is not plowed. Such a field can be spaded by hand, but the excessive labor almost precludes a high standard of living. Without draft animals mankind might never have realized the wonderful possibilities of the wheel, which led to modern machinery. The desire to utilize horses or other animals more fully for draft purposes presumably led primitive man to put wheels under his sledges, and later to gear wheels together so that his animals might grind grain, pump water, and the like. Thus in many ways beasts of burden and draft animals have been essential in the evolution of the highest types of civilization.

Motor transportation is sometimes supposed to have made the horse no longer a necessity. This is true in limited regions, but not in the world as a whole. Motor traction on the farm is still far too expensive for most of mankind. The United States has five out of six of the world's motor vehicles, and a still larger percentage of the tractors. Except for a few million people in Canada, Australia, New Zealand and Argentina, the overwhelming majority of the 1700 inhabitants of the parts of the world outside the United States depend almost entirely upon horses, mules, cattle, and even camels for plowing and other farm work. In the United States, however, the number of horses, mules, and asses *in cities and villages* diminished from 3,470,000 in 1910 to 2,100,000 in 1920, and has now fallen still lower. *On the farms* of the United States the horses and mules increased from 24,149,000 in 1910 to 25,200,000 in 1920, the maximum being reached in 1919. According to the census of 1925 the number had declined to 22,289,000. This decrease of 11.5 per cent represents a decrease of 16.3 per cent in horses and an increase of 13.9 per cent in mules, for mules are used mainly in the South where tractors and trucks are still scarce. Further evidence of a diminished demand for horses and mules is found in the fall of the birth rate from 90 colts per 1000 animals in 1919 to only 44 in 1924, and in the almost steady decline in the average farm price of horses from $146 in 1910 to $76 in 1924.

It should be noted, however, that according to the Department of Agriculture, the birth rate of horses now seems to have ceased to decline. Moreover, during and after periods of depression on the farms there is often a decline in the number and price of animals. For example, it is estimated that from 1893 to 1897 the number of horses and mules in the United States declined 10½ per cent and the price fell 49 per cent. Thus even without automobiles, the decline in the numbers and price of farm animals was essentially the same as in the more recent case. The two cases are not parallel, however, for in the present case the automobile and especially the truck and tractor are making steady inroads upon the work formerly done by horses.

In spite of this there still remained approximately 23,500,000 horses and mules in the United States in 1925. The case of horses is much like that of railroads. Automobiles and trucks now do an immense business in carrying both passengers and freight, and have caused a considerable number of surburban trains and minor railway lines to be given up. But they have not put the railroads out of business. Indeed they have not even diminished the average freight haul, and in 1923 had not reduced the passenger business below the level prevailing before the Great War, as appears in the following figures:

	Billions of Passengers Carried One Mile	Billions of Tons of Freight Carried One Mile
1890	11.8	76.2
1900	16.0	141.6
1910	32.3	255.0
1915	32.5	343.5
1920	47.4	413.7
1923	38.3	416.3

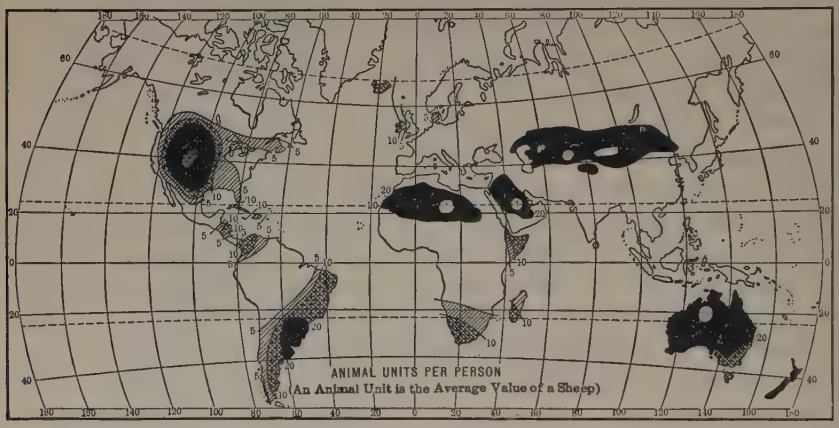
In the same way the automobile, truck and tractor are indeed displacing the horse in many places, but even in the United States it is by no means certain how far the present decline in the number of horses and mules will go. In almost no other country has motor traction yet caused any appreciable decline.

The geographical significance of all this lies in the fact that horses and tractors are the most economical source of power for farms in different environments. The tractor may some day do practically all the work where well-drained, level land is available, where the soil is rich enough so that the farmers have considerable capital, and where the farms are large enough or the spirit of cooperation great enough so that there is work enough to keep the tractors busy much of the time. One interesting result of the introduction of tractors is that the more prosperous and progressive farmers tend to buy land enough to fit the capacities of their machines. Hence tractors are very numerous in regions like central Illinois where the soil is especially fertile; they are less numerous in such regions as southern Illinois with its poor gray soils; still less so in places like Mississippi; and almost unknown in backward regions like the Kentucky Mountains.

The horse and mule are of relatively greatest importance in regions where tractors are least important. This case is like hundreds of others: each new invention produces its greatest effect in the most favored centers; the old methods persist elsewhere. Thus, although horses and mules are fast being displaced by the tractor in the most favored lowlands of the United States, Canada, Australia and Argentina, their importance has as yet diminished very little on the farms of most parts of New England, the South, and Europe. Even in the best agricultural areas the demand for draft animals elsewhere may long make it profitable to keep horses for breeding purposes, and that in turn will make it worth while to use them for at least part of the farm work. Thus our net conclusion is not only that the horse and other draft animals have been and still are of almost incalculable importance in the evolution of

civilization but that such animals will long continue to be of high value except in the most favored areas.

The General Distribution of Domestic Animals.—Before discussing the distribution of the individual species of domestic animals, let us consider that of all species taken together. This obliges us to determine the relative importance of the different animals. How many hens or sheep, for example, are equivalent to a horse or cow? The United States Department of Agriculture uses a standard based on the amount of food consumed per animal, a horse, cow, or ox being counted as an animal unit equivalent to 5 swine, 7 sheep, or 100 hens. For our purpose, a standard based on values is advisable, for the price of an



From Economic Geography.

Fig. 65.—Distribution of Domestic Animals per Capita.

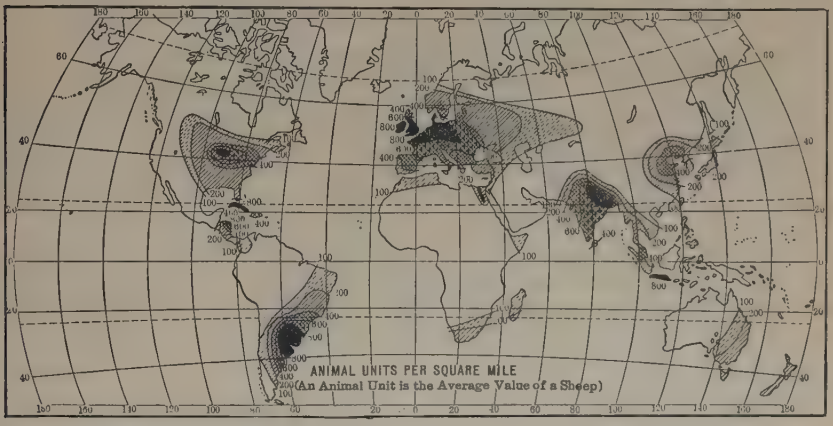
animal is the best available measure of its all-around usefulness. On the basis of the United States censuses of 1910 and 1920, together with data from other countries, the relative values are approximately as follows:

Poultry	0.1	Llamas	1.5
Goats	0.5	Asses	1.5
Reindeer	1.0	Cattle	5.0
Dogs (for work)	1.0	Horses	12.5
Sheep	1.0	Mules	17.5
Swine	1.5	Camels	20.0

These numbers may represent dollars, pounds sterling, francs, or any other unit of value. What we want is merely a measure of the relative value of one animal compared with another. As used here, an animal unit happens to correspond to the value of a sheep, work dog,

or reindeer; we might equally well use a unit one-tenth as large and equivalent to a hen, or five times as large and equivalent to a cow. By adding together the relative values of all the animals in each country or state, we obtain the *total animal units* (Table 13 in Appendix), and from this it is easy to determine the animal units *per capita* (Fig. 65), and per square mile (Fig. 66).

The Relation of Density of Population to Numbers of Animals.—One of the outstanding features of the maps of animal units per square mile and per capita is that they are almost opposite in appearance. Where animals are numerous per capita (Fig. 65), they are generally scarce per square mile (Fig. 66), and vice versa. Often, to be sure,



From Economic Geography.

FIG. 66.—Distribution of Domestic Animals per Square Mile.

this generalization is obscured by other factors such as climate, stage of civilization, relief, diseases, and the location of markets. Its general truth, however, is well illustrated in Fig. 67. The dotted lines show the number of animals per capita according to the scale on the left, and the solid lines the number per square mile, according to the scale on the right. The various states or countries are arranged according to the density of their population per square mile, the most densely populated being on the left and those sparsely populated on the right. In each section of Fig. 67 the two lines go up and down together in their minor fluctuations, but the dotted line shows a general tendency to *rise* from left to right, while the solid line shows a similar tendency to *fall*. The minor irregularities are due to the other factors mentioned above; the general tendency for the two lines to move in opposite directions is due to a deep-seated mathematical relationship among

three factors: (1) the density of the human population, (2) the density of the animal poulation, and (3) the number of animals in proportion to the people. The same tendency appears in similar diagrams for each continent, and even in those where states like those of the United States, Canada, and Australia are employed. This means that all over the world, the places that have many inhabitants per square mile tend to have many animals per square mile, and few per capita. The

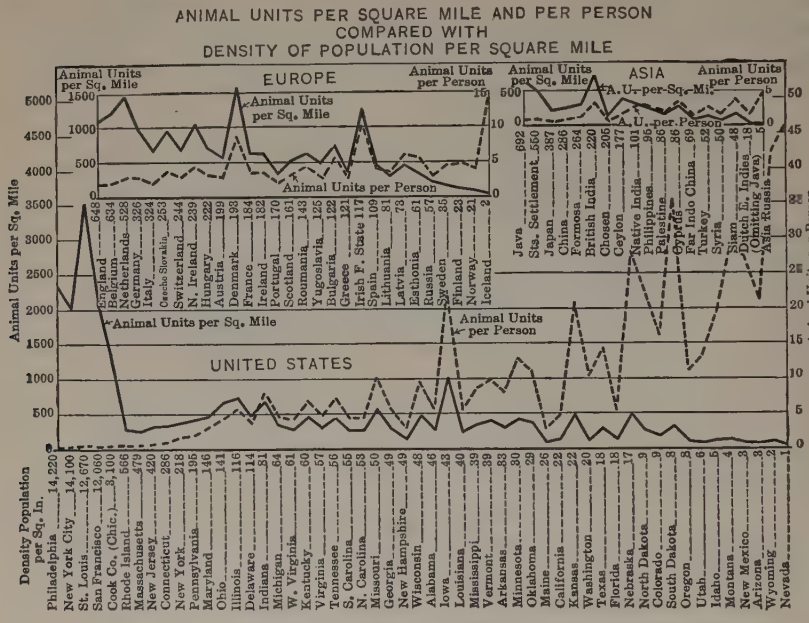


FIG. 67.—Density of Population among Domestic Animals Compared with Man.

Notice that in each section of this diagram the solid and dotted lines cross only once, and this crossing is always at the same density of population, just under 100. In similar diagrams for other continents, and for the states of different countries, the same conditions prevail. A change in the scale on which either of the curves is plotted of course alters the crossing point, but does not alter the fact that the lines cross only once, and that the crossing point for all diagrams drawn on the same scale is the same.

opposite is equally true, for regions with few inhabitants per square mile tend to have few animals per square mile, although the number per capita is large.

In Europe this relationship can be seen with special clearness. England and Wales, with a density of 648 people per square mile (as shown by the figures following the word *England*), Belgium with 634 per square mile, and the Netherlands with 528, have many animal

units per square mile, namely 1070, 1202, and 1438. At the other end of the scale Finland with 23 people per square mile, Norway with 21, and Iceland 2, have few animal units per square mile, namely, only 110, 91, and 33. On the other hand, England and Wales have only 1.7 animal units per capita, Belgium 1.9, and Netherlands 2.7, whereas Finland has 4.0, Norway 4.3, and Iceland 14.2.

The curve for the United States in Fig. 67 although more irregular than that for Europe, proves the same thing. One of its most extraordinary features is the great height of the solid line at the left and where five large cities are shown. In large cities animals are relatively inconspicuous because of the great numbers of people and automobiles. Nevertheless, in proportion to their area, cities generally contain far more animals, especially horses, than do corresponding rural areas. Another notable feature of the United States curve is the high general level of the dotted line. This indicates many animals per capita and is a rough indication of the generally high standard of living arising from the newness of America, the energy of its people, and the great natural advantages.

In spite of the common opinion that the dense human population of China and Japan leaves little room for animals, the third curve in Fig. 67 shows that Asia follows the law just given quite as closely as Europe and the United States. China proper, according to the best available estimates, has a density of 286 per square mile for its human population, and 246 animal units for its animal population. The corresponding figures for Japan are 387 for people and 206 for animals. On the other hand, the number of animal units per person is low, as might be expected, being 0.9 for China and 0.5 for Japan, but both of these are higher than Massachusetts, 0.4.

Value of Different Kinds of Animals for Transportation and Draft.—From the standpoint of transportation and farm work, the ideal animal possesses the following qualities: (1) Intelligence, so that it can be taught to start and stop at the word of command, and conduct itself quietly when ridden, harnessed, loaded, or driven. In this respect the dog, horse, donkey, and elephant rank especially high; cattle, reindeer, and camels are moderately good, and llamas, sheep, goats, and pigs relatively poor. (2) Sufficient size and strength to carry one man long distances easily. The horse, ass, all six members of the cattle family, the reindeer, camel, llama, and elephant satisfy this requirement fairly well. That is one reason why they have been domesticated. The camel, however, is too large, for he can easily carry two or three people, and the elephant is still larger. Such large animals do not pay, for a man needs to ride alone far more often than with a companion. To feed

and care for a big animal when a smaller one will suffice is like paying a man to do a boy's work. The donkey, reindeer, and llama, on the other hand, are too small. They can carry a man, to be sure, but not easily for long distances, especially if he has baggage. Horses and cattle are almost exactly the right size. (3) Fairly good speed day after day. Here the horse and camel are best. Cattle, donkeys, reindeer, and elephants are less speedy, or get tired more quickly. The elephant has little endurance and can work only a few hours per day. (4) An easy gait. In this respect the horse and the ass are much the best. (5) Ability to pull as well as carry. As a factor in human progress it is especially necessary to have animals that can pull wheeled vehicles, and draw the plow through grassy sod. Here again the horse is probably the best of all animals, but cattle are also excellent. The donkey would be almost equally good, but is not heavy enough. The camel, llama, and elephant lack the hard hoofs which are essential for good draft animals. (6) Ease and cheapness with which the animals can be fed and cared for and the young brought to maturity.

According to these criteria, the horse stands much ahead of all other animals so far as transportation and farm work are concerned. Cattle, donkeys, and camels rank fairly well. Reindeer, elephants, and llamas are also useful. The dog, sheep, goat, pig, and alpaca are of practical use only when no other animal is available.

Relative Value of Animals as Producers of Food.—If all animals could be raised with equal ease, their value for food would depend on (1) the quality of the meat, (2) the extent to which they furnish other food products such as milk and eggs, and (3) the rapidity with which the young grow to maturity.

(1) All of the 17 *Ungulata*, or hoofed animals, in the table on page 180, furnish excellent meat, as do the unstarred birds and the rabbit. Among the unstarred animals only the carnivora and insects fail to furnish good meat. Differences in the quality of the meat, although important, are generally minor factors in determining where each species shall be raised, unless it be in the case of the rabbit and pig.

(2) A far more important consideration is the extent to which an animal furnishes milk or eggs. All the ungulates in our list, except the pig and elephant, are milked in certain regions, and in all cases the milk is an admirable article of diet. Nevertheless, ordinary cattle, together with goats and sheep, far surpass other animals in this respect. That gives them great value, for milk appears to be the most valuable single product in the whole world. (Table A, p. 9.) The world's annual production of eggs is worth roughly 1800 million dollars, or about as much as oats, or sheep. As a producer of eggs, no bird can compare

with the hen. Thus as sources of food products other than meat, the most desirable animals appear to rank as follows: cattle, hens, goats, sheep.

(3) As a rule, the more rapidly an animal reaches maturity, the less is the expense of producing a given weight of food for man. Young horseflesh is as good as the best beef, but the horse requires nearly four years to reach maturity, an ox little more than two. The sheep, goat, and pig, and the edible domestic birds are still better in this respect, for they attain almost their full size within a year. The pig and the birds have the further advantage of producing many young at one time, and more than one litter or brood per year. If we disregard the cost of their food, the best animals probably rank nearly as follows in respect to the amount of meat in proportion to their food; hens, pigs, sheep, goats, cattle.

Relative Value of Animals as Producers of Clothing.—As sources of materials for clothing, no animal, unless it be the alpaca, can compare with the sheep. Wool ranks second only to cotton as a material for clothing. It owes its value partly to the fact that, unlike fur, it can be sheared or plucked from the living animal, but chiefly to the ease with which it can be spun into thread, and also to the facility with which old wool that has already done duty in clothing or otherwise can be reworked. Nevertheless, the world's annual production of wool (900 million dollars), reckoning again at American prices, is worth only about a tenth as much as the milk produced in the same time. The llama, camel, reindeer, and goat come next to the sheep and alpaca as sources of materials for cloth, for they yield hair which is soft and woolly and can be made into good clothing. Other domestic animals are of little use for clothing materials other than leather. But the world's annual production of leather is worth somewhere near 700 million dollars, or more than three-fourths as much as the wool. As the best leather comes from cattle and horses, that gives these animals another claim to high value.

The World's Most Valuable Animals.—Suppose that all domestic animals could live equally well in all environments. Which would be raised in greatest numbers? The horse would generally be the choice for transportation and draft purposes. Ordinary cattle would be raised practically everywhere because of their combined efficiency as producers of meat, milk, and hides, and because they are useful for transportation and farm work. There would be no use in raising the other species of the cattle family, for they yield less milk than European cattle, and at least the yak and water buffalo are less tractable. Sheep, likewise, would be wanted rather than goats, but the alpaca might be as

ARCTIC CIRCLE
TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
ANTARCTIC CIRCLE
Long. 60° East from 30° Green.
160° Long. 140° West from 100° Green.
250 or over to the Sq. Mile
125 to 250 " " "
25 to 125 " " "
2.5 to 25 to the Sq. Mile
Less than 2.5 to the Sq. Mile

FIG. 68.—World Map Showing Density of Population.

popular as the sheep. Pigs would be raised in large numbers because they yield much meat in proportion to their food, and are easily fed. Hens would be still more in demand for the same reasons, and also because they are the best producers of eggs.

Silkworms and bees occupy unique though minor places in supplying human needs, and therefore would presumably be widely raised, even though artificial silk is now becoming common. Accordingly, if each kind of animal could be raised as easily and profitably in one part of the world as in others, we should expect the following animals to be numerous wherever people are numerous and scarce wherever people are scarce: horses, ordinary cattle, sheep, hens, pigs, silkworms, and bees. Others would presumably be raised only as luxuries or for some special purpose.

As a matter of fact, the actual distribution of each of the domestic animals differs greatly from that of man. The causes of these differences are our next subject of investigation. They include climate, relief, soil, markets, stage of progress, density of population, social, religious, and political conditions, and certain other factors, as will appear in the next chapter.

EXERCISES AND PROBLEMS

1. Compare the general characteristics of countries that stand higher than would be expected in the number of animal units with those that stand lower than would be expected. From Fig. 67 make lists of the states and countries that have decidedly more animal units per square mile and per capita than would be expected from their population. Make a similar list of those standing especially low in both respects. What physical qualities and what occupational and social conditions seem to be characteristic of the states and countries in each list? Examine the figures for each region in Tables 14, 18, and 19 and make a list of the animals of each country in order of their importance per capita and per square mile. Is there any systematic tendency for certain types of animals to be more important in one list than in the other?

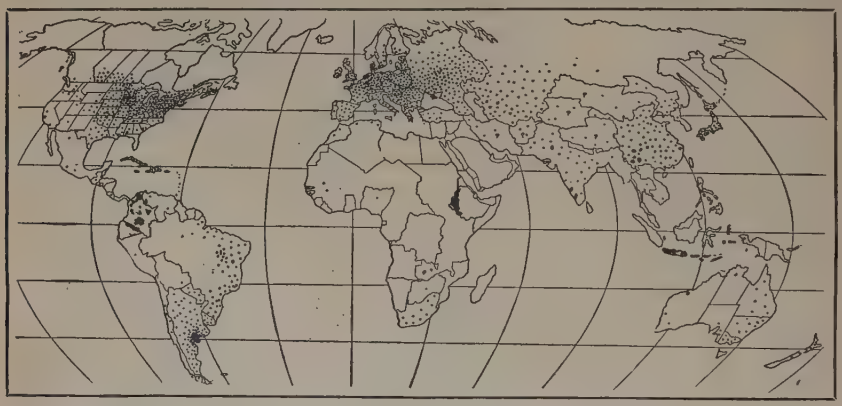
2. Compare Figs. 65, 66, and 68. Point out the degree to which each of the animal maps resembles the population map. In what important respects does each of the animal maps fail to be the opposite of the map of density of population? Explain these failures.

3. In Fig. 67, Iowa, South Dakota, British India, Denmark, and the Irish Free State represent extremes of one kind; West Virginia, New Hampshire, Maine, Portugal, Lithuania, and Chosen represent extremes of the other kind. For these 11 regions prepare diagrams like Fig. 76 for horses, cattle, sheep, and swine, respectively, arranging the regions in order of the number of animals (*A*) per capita, and (*B*) per square mile. Indicate by asterisks the countries in each diagram which fall below the expected level in Fig. 67. What generalizations can you draw from your diagrams?

CHAPTER XIV

DISTRIBUTION OF DOMESTIC ANIMALS

The Distribution of Horses.—In one important respect, animals like the horse, that are used for transportation, resemble those like the dog and cat, that are used for protection. They are of little use unless they live so close to their owners that they are available all the time. Wool, meat, eggs, and even milk may be shipped ten miles, or even ten thousand if rightly treated, and be almost as useful as if raised in the back yard, but a dog or cat living a quarter of a mile away is of little use, and if a farmer's horses were kept five miles away he might



Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 69.—World Map of Horses.

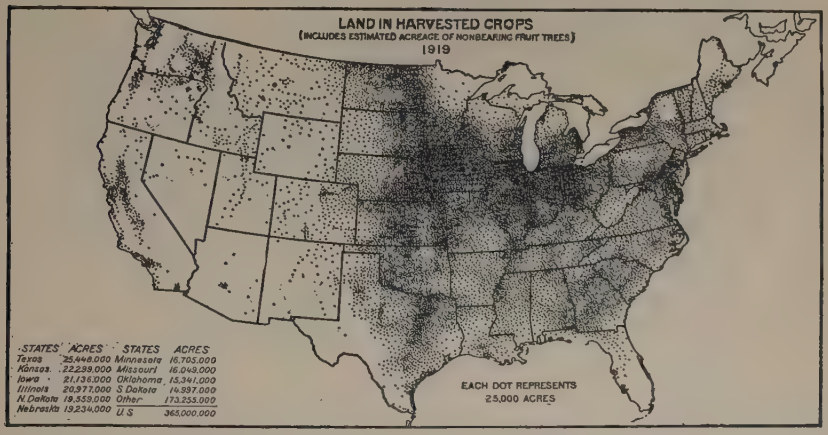
almost as well have none. Therefore, if horses could thrive everywhere, their distribution over the earth's surface would presumably be almost identical with that of man, except that backward and unprogressive people would keep less than would the more progressive.

A comparison of Figs. 69 and 1 shows that in general the distribution of horses is like that of people in North America and Europe, the continents with the best climates and the most progressive type of civilization. The ratio of horses to people appears much greater than it really is, because each dot represents only 100,000 individuals on the

horse map and 1,000,000 on the population map. If the number of persons per dot were diminished in South America and increased in Asia, and if the horse map could be completed in China and other countries where there are no good statistics, the maps of horses and people would show many resemblances in those continents also. Only in Africa do the two maps become almost completely different, for horses are there almost absent except in the far north and south.

In spite of general resemblances, there are great differences in the distribution of horses and people. For example, the number of horses per thousand people in various continents is approximately as follows:

Africa	14	North America	186
Asia	18	South America	270
Europe	78	Australasia	300


LAND IN HARVESTED CROPS
(INCLUDES ESTIMATED ACREAGE OF NONBEARING FRUIT TREES)
1919
STATES ACRES STATES ACRES
Texas 25,446,000 Minnesota 16,705,000
Kansas 22,239,000 Missouri 16,049,000
Iowa 21,136,000 Oklahoma 15,341,000
Illinois 20,977,000 S Dakota 14,997,000
N Dakota 19,559,000 Other 173,253,000
Nebraska 19,234,000 U S 365,000,000
EACH DOT REPRESENTS
25,000 ACRES

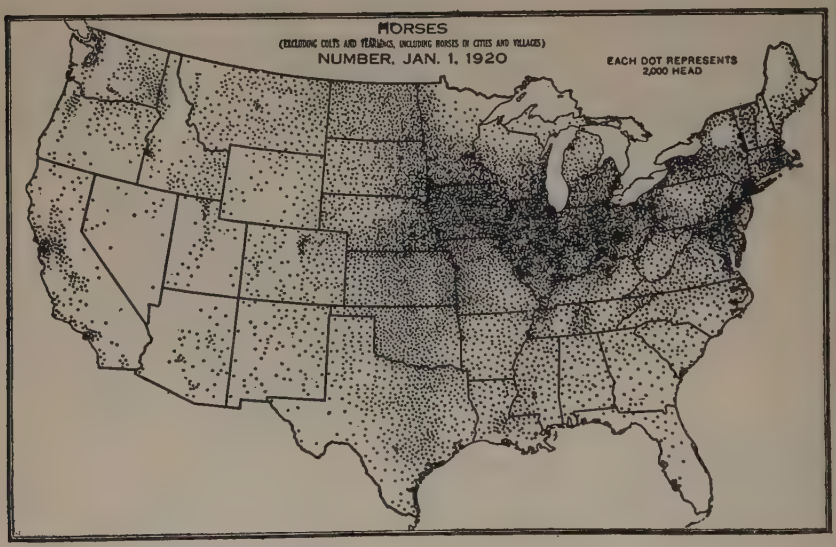
Courtesy U. S. Department of Agriculture.

FIG. 70.—Distribution of Cultivated Land in the United States.

These great differences are partly climatic and partly cultural. The cultural differences include (1) the relatively low stage of progress in much of Asia and Africa; (2) the contrast between highly developed industrial conditions in Europe and North America, and the relative absence of such conditions in South America and Australia; and (3) the density of population, for in the old, long-settled countries of Africa, Europe, and Asia the number of people is as dense as is compatible with the present standards of living, whereas the other three continents still have room for more people without lowering their standards of living.

In order to appreciate more clearly the factors which determine the distribution of horses, compare Fig. 70, showing all the land in

harvested crops in the United States, with Fig. 71, showing the distribution of horses. The two are astonishingly alike in (1) the concentration of animals in the Corn Belt from Ohio to Iowa; (2) the sparsity of animals in the dry regions of the West, and in the more rugged areas of the East; (3) the local concentrations wherever level land, irrigation, and other conditions permit farming in the western half of the country; (4) the belts of relative density extending southward along the fertile Mississippi Valley and farther west in the strip of good soil from Kansas to eastern Texas; (5) the general decline southward where both climatic and social conditions are relatively unfavorable


HORSES
(EXCLUDING COLTS AND YEARLINGS, INCLUDING HORSES IN CITIES AND VILLAGES)
NUMBER, JAN. 1, 1920
EACH DOT REPRESENTS 2,000 HEAD

Courtesy of U. S. Department of Agriculture.

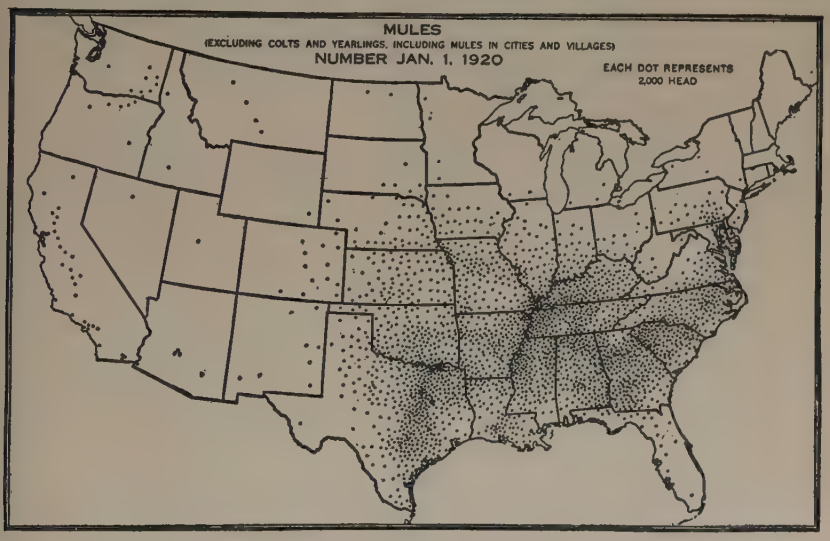
Fig. 71.—Distribution of Horses in the United States.

to the most productive agriculture. Note, however, that the maps display at least two marked differences. One is the concentration of horses in knots around the eastern cities, and the other is that the number of horses declines southward much more rapidly than the amount of land under cultivation.

This last condition is largely explained by the fact that the horse, like every other animal and plant, has a distinct climatic optimum. Departures from that optimum inevitably cause the number of horses to decline until zero is reached at the extreme limits. But the optimum for the ass is different from that for the horse. The ass can stand greater heat, greater drought, coarser food, and greater neglect. Mules inherit

these qualities from their fathers, but inherit the size and many other good qualities of their mothers, which are horses. As climatic conditions become unfavorable by reason of warmth or aridity, asses tend to replace horses, but among people of progressive tendencies only enough asses are kept to serve as breeding animals, and large numbers of mules are raised. Fig. 72 shows how mules become the dominant work animals as one goes southward in the United States. Their distribution follows the same laws as that of horses so far as the relation to cultivated land and cities is concerned.

Europe illustrates the factors controlling the distribution of horses


MULES
(EXCLUDING COLTS AND YEARLINGS, INCLUDING MULES IN CITIES AND VILLAGES)
NUMBER JAN. 1, 1920
EACH DOT REPRESENTS
2,000 HEAD

Courtesy of U. S. Department of Agriculture.

Fig. 72.—Distribution of Mules in the United States.

quite as well as the United States. Throughout all the central area horses are distributed almost in proportion to the cultivated land, with local concentrations in cities as at London, Paris, and Moscow, and in places especially favorable for horse-breeding. The end of Cape Finisterre in France has about three horses per capita because the dampness favors wonderful grass, but is not so favorable for crops. Northward and southward the horses diminish faster than the people. In the north the reindeer replaces the horse; in the south, the ass, with a belt of mule-using country between the main areas of horses and asses.

In the other continents horses decline in number in response to lower human standards and unfavorable climate. Toward the deserts, after

becoming scarce in the belt where asses are used, the horses almost disappear and the camel becomes the dominant beast of burden. In spite of their fame, Arab horses are very scarce; none but the rich can own them. They have to be most tenderly cared for, which is one reason why they are treated almost like members of the family and extolled in poetry and song. In Africa, south of the Sahara, the plains of the Sudan and the central highlands afford fairly good food for horses, but the climate is not favorable, and in many places the tsetse fly almost exterminates them. The forests of equatorial Africa depart still farther from the equine optimum. There the climate, together with many pests in addition to the tsetse fly, causes vast areas to have no horses whatever. In fact, practically all domestic animals are so much at a disadvantage that this vast African area is the region, above all others, where men still carry loads hundreds or thousands of miles on their heads. Only where the climate ameliorates and the parasites decline in number toward the far south do horses again become numerous.

In Asia similar but less extreme conditions prevail. Horses thrive fairly well on the steppes of southern Siberia and are very numerous per capita. Among the Khirgiz they are so prized that the word "animal" used alone, generally means "horse." A sheep may be called a "sheep animal." Nevertheless, the number of horses per square mile is small, for the dry climate with its great contrasts between summer and winter does not permit a large population either of men or horses. In northern China and Manchuria, horses again become fairly numerous, but are interspersed with asses, mules, and camels, as befits the climate. Japan likewise has a fair number of horses per square mile because of the dense population, but the climate and vegetation are so unfavorable that the number per capita is extremely small. Horse-breeding is largely confined to specially favored areas in the cooler and drier north.

Southward in Asia, horses decline as in tropical Africa. In India, camels and asses do much of the work of horses in the dry northwest, oxen do it in the moderately moist parts of the east and south, and water buffaloes wherever the climate and the opportunities for irrigation permit rice to be raised. In Indo-China and southern China, where the environment is especially unfit for horses, the water buffalo becomes almost the sole beast of burden. At Hongkong, for example, in spite of the large number of English people, there is only a handful of horses. Finally, in the most steadily warm, moist parts of Asia, where tropical forests provide a habitat peculiarly unfit for almost any domestic animals, man ekes out his own task of burden-bearing by using elephants. These animals, like dogs and reindeer in the far

north, yaks in the Himalayas, sheep in the highest parts of Tibet, llamas in the Andes, and human coolies in central Africa, the Amazon basin, and parts of southeastern Asia, illustrate how man turns to less and less effective types of animals, as he finds himself in environments more and more unlike the optimum for the horse, the best of all animals for transportation.

The Distribution of Cattle.—The distribution of other domestic animals follows the same laws as that of horses, but with important differences in details. In general the world map of cattle (Fig. 73). with its heavily shaded areas in India, Europe, the United States, and South America, seems more like that of population (Fig. 1) than does

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

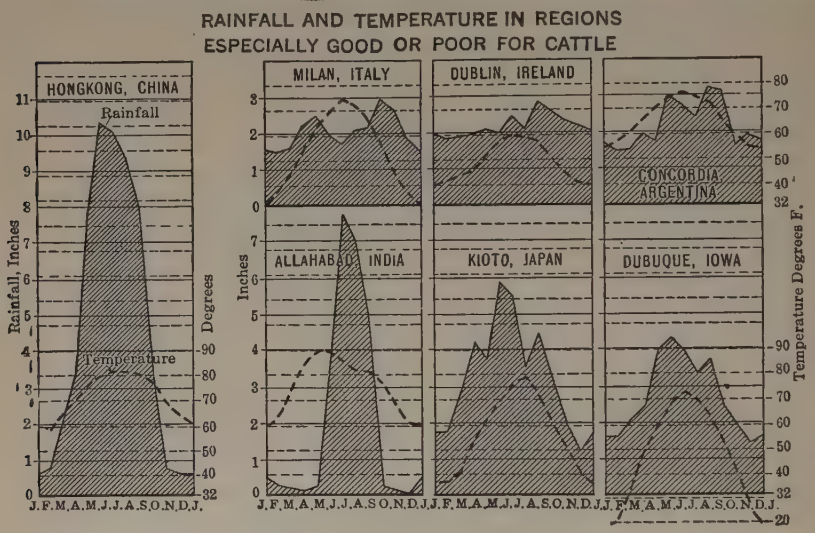
Fig. 73.—World Map of Cattle.

the map of horses (Fig. 69). This does not mean that ordinary cattle rival men in their ability to live in a wide variety of climates, although they are less sensitive than horses to certain pests and diseases of warm regions. The reason for the abundance of cattle in southern Asia is that several species are included in Fig. 73. The cattle in Europe, the United States, South America, and Australia are generally of the European species (*Bos taurus*); those in southern Asia belong to the other five species shown on page 180.

The distribution of the European species of cattle is much like that of horses, although there is no such aggregation of animals in cities. Since modern transportation permits even so perishable a product as milk to be raised with profit a hundred or more miles from the cities where it is consumed, and since butter, cheese, and meat can stand almost any amount of transportation, the tendency in progressive countries is to keep numerous milch cows within a few hundred miles

of all great cities, a smaller number within shorter distance of smaller communities, and a few upon practically every farm. But cows whose milk is used for butter, cheese, or condensed milk are kept where the climatic conditions and forage, and the demands of other crops make them most profitable.

This, however, is true only of European cattle. In Asia, although a few are kept for meat and milk, the vast majority are work animals, kept especially for plowing. Hence their distribution corresponds closely with that of the farmers, and there are also many in the cities.



From Economic Geography, Vol. I.

FIG. 74.—Climatic Types in Reference to Cattle.

Dotted lines indicate temperature per scales on right; shading indicates rainfall per scales on left.

The optimum for European cattle is fairly cool, moist summers, especially if milk rather than beef is the main object, rain at all seasons, or else irrigation to supply fresh forage, and so little cold weather and snow that the grass is green the year round. This type of climate is illustrated by Dublin in Fig. 74. The cool summers discourage many kinds of agriculture, but foster an abundance of tender, nutritious grass and other forage plants. If good markets are accessible, the farmers in such regions turn largely to dairy farming, as in the Irish Free State, the Netherlands, and Denmark where there are 156 cattle per square mile (Table 14).

Such equable climates, with admirable conditions for cattle in both summer and winter, are rare. If the summers are cool and moist, but

the winters cold, as in Vermont, northern New York, Wisconsin, and Minnesota, the dairy industry is hampered only slightly, for low temperature does little harm, if the cows are fed on good hay and juicy silage. If the summers are warm enough so that corn can be raised, milk may still be of great importance, as in Iowa (Dubuque in Fig. 74), but the fattening of beef cattle is also likely to be highly profitable. For these reasons, and also because it is farther from the great eastern centers of population, Iowa with 23 dairy cattle per square mile falls behind Wisconsin and Vermont (41 per square mile), New York, (33), Connecticut (30), Ohio (27), Rhode Island (25), and Pennsylvania (24), and stands only a little ahead of Massachusetts and Minnesota (22), and Illinois and Indiana (21). On the other hand, Iowa has 58 beef cattle per square mile, whereas its nearest rivals have only 35 in Nebraska, 30 in Kansas, 28 in Missouri, and 26 in Illinois (Table 18).

A region with summers as warm and rainy as those of Iowa, and with winters sufficiently moist and warm to support good pasturage but not to make the grasses tough, is excellent for beef cattle. That is why northeastern Argentina and Uruguay (Concordia in Fig. 74) are to-day the world's greatest beef-raising center. Dairy products may also be produced there, but not so well as where the summers are cool.

The Po Valley in northern Italy is a cattle center, although much less important than centers in the North Sea countries, the north central United States, and the Argentine region. One reason for its intermediate position is the climate (Milan in Fig. 74). The temperature is much like that of Iowa, though better, for the summers are only a trifle warmer than at Dubuque, whereas the winters are considerably warmer. On the other hand, although northern Italy, like all the chief cattle centers, has a moderate rainfall of $1\frac{1}{2}$ to 2 inches per month in winter and more at some seasons, its summer rainfall is too light. When the temperature averages 72 or 73° F. for three months, a region with only 2 inches of rain per month is likely to become so dry that irrigation is desirable although not essential, and the pasturage falls off in quality.

Physical Environment and Types of Cattle.—Different types of environment support different breeds or even species of cattle. This arises partly from the choice of the breeders, partly from the selective action of nature, and partly from other causes such as mutations. A well-known example is the contrast between Holsteins and Jerseys. The Holsteins originated on the northern coast of Holland where the moist, cool summers combine with a heavy clay soil and very level land to make the grass luxuriant, but watery. Cows with large bony frames and correspondingly large abdomens are apparently better able than others to support themselves and their calves on such vegetation.

The watery food apparently tends to make the milk abundant, but relatively low in butter fat and other solids. The island of Jersey, on the contrary, although as rainy as Holland, averages about 4° F. warmer in summer, and has light loamy soil and many hills. Hence the herbage is shorter, finer, and less watery than in Holland, the Jersey cows do not need large stomachs or large frames, and the selection of nature and of the breeders has preserved a type less massive than the Holsteins, and notable for the production of milk which though moderate in quantity is very rich and creamy.

The Non-European Species of Cattle.—The differences between species of cattle are like those between breeds, but more pronounced. Just as the environments of the Dutch coast and Jersey have led to the selection of special types by man and nature, so the environment of southern Asia has cooperated with other agencies in producing distinct species of cattle such as the Brahman or zebu type, the gayal, yak, water buffalo, and banteng. It is these which give southern Asia and the East Indies their heavy shading in Fig. 73. The Brahmans are the main type of cattle in India, especially in the north where the Indo-Gangetic valley is almost black in Fig. 73. The climate where they are most numerous is represented by Allahabad in Fig. 74. It is warm at all seasons and excessively hot in the spring before the summer rains begin. The rainfall comes almost entirely in summer, the contrast between the seasons being enormous. The native cattle of such a region must eat relatively coarse, watery forage during the rains and the same kind in its tough, dry state in winter. They must be able to resist droughts, which are often severe, and must not be sensitive to insect pests such as the ticks which cause Texas fever.

As long ago as 1849, the knowledge that the Brahman cattle possess such powers of resistance led to the introduction of a few into South Carolina. During the present century a considerable number have been brought, and have been extensively crossed with European cattle on the Texas coast. So well do the cross-bred animals endure drought, ticks, flies, and other pests that Brahman blood is being introduced all over the South as fast as possible. In Brazil, huge prices are paid for high-grade Brahman bulls from India.

Even the Brahman cattle cannot stand all climates. Neither a cool, moist climate, nor a steadily moist tropical climate is good for them. Hence among the mountains north of the Indo-Gangetic plain in India, and also in other moist mountains of South India, the gayal replaces the Brahman. In the lofty, snowy Himalayas the gayal in turn gives place to the yak. Toward the south, likewise, the Brahmans decline in relative importance, and the water buffalo increases, until the two

species are about equally numerous in the steadily warm, moist climate of Ceylon. Farther east in the moist regions of Burma, Siam, Indo-China, and the East Indies, still another species, the banteng, largely replaces the Brahman type, but not the water buffalo.

The relation of the Brahman, gayal, banteng, water buffalo, and yak to European cattle is important because it illustrates one of the chief principles in respect to the distribution of domestic animals. The same principle is illustrated by the relation of the ass, camel, ox, llama, reindeer, and dog to the horse. Wherever man is able to raise the best type of animal for any purpose he does so, but where the more valuable type cannot thrive, others replace it. Nevertheless man constantly strives to extend the range of the best species, partly by selecting certain types and thus establishing new breeds, partly by crosses with other species, and partly by providing special kinds of food and shelter. In general, the number of breeds and their degree of diversity are a rough measure of the extent to which man values an animal. Few people have seen more than one variety of peacock, although a pure white type is in existence; but almost everyone is familiar with Leghorns, Plymouth Rocks, Bantams, Rhode Island Reds, Wyandottes, buff Cochins, and various other kinds of hens.

A Handicap of the Far East.—The region where there is most need of breeds of cattle with peculiar adaptations to climate and food is the southeastern coast of Asia. There dwells by far the greatest population that suffers for lack of domestic animals. Hongkong, with its heavy rains and high temperature throughout most of the year, represents the extreme of this type (Fig. 74). Among the dairy cows kept there by the British, the yield of milk appears to decline systematically when the weather becomes excessively hot and damp. The native grasses are so big, watery, and tough that horses, cattle, and sheep do not thrive on them. Hence the few dairy cattle are fed on guinea grass, a species introduced from more tropical regions and raised as a cultivated crop. Even this is so poor that the cows receive special rations, the composition of which is guarded as a trade secret. Nevertheless, the cattle imported from Europe die at an alarming rate. Because domestic animals thrive so poorly in South China, millions of acres of rugged land, such as form the finest pastures in Switzerland, are left unused. In Japan, although the conditions are not so bad as in southern China, attempt after attempt to introduce sheep has failed, and in the most populous parts of the islands neither horses, cattle, nor swine really thrive. The rainfall (Kyoto in Fig. 74) does not greatly exceed that of Iowa, but abundance of moisture throughout the year, and the absence of weather cold enough to check growth effectively seem to cause the Japanese

vegetation to be very poor as forage. Iowa, with its natural grasslands and restricted open forests, is almost ideal for cattle; Japan with its dense, damp forests and coarse reed-like grasses provides a peculiarly unfit environment. Hence Japan has only 9 cattle per square mile and 25 per thousand people, in contrast with 81 per square mile and 1850 per thousand people in Iowa.

The Distribution of Swine.—Domestic swine possess qualities which seem to favor an extremely wide distribution, like that of man himself. In the first place, swine breed so freely and grow so rapidly that they furnish a great supply of meat and fat in proportion to their food. Second, they eat many kinds of food, such as acorns, potatoes, and garbage, which are of little use for most of the domestic animals. Third,

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 75.—World Map of Swine.

although the exact facts are not known, domestic swine appear to be descended from several wild species, sufficiently alike to breed freely together, but diverse enough to include varieties adapted to almost every environment.

In spite of these advantages, swine are not nearly so widely distributed as horses, cattle, hens, or even sheep. Even with more exact data for China Fig. 75 would not look much like the map of population (Fig. 1). Even in the United States the swine show a marked concentration in the states from Ohio to Nebraska, while in Europe they abound in the Low Countries, Denmark, and western Germany. South America, especially Brazil, has a fair number distributed much as are the people; the Philippines nearly as many in proportion to the population; China, Australia, and South Africa about one-fourth as many proportionally as in the United States; and Japan a few—half as many

as Australia, but only one-twentieth as many per capita. (See Fig. 76.) Vast areas in Asia and Africa are utterly blank in Fig. 75; in the United States such densely settled sections as the northeastern states have surprisingly few.

The explanation of these conditions is found partly in the fact that although the pig eats nearly everything, it becomes commercially profitable chiefly in regions where one of the following types of food is cheap and abundant: corn, as in Iowa and adjacent territory; potatoes, as in Belgium, the Netherlands and Germany; and barley and skim milk, as in Denmark. Relatively high prices for these commodities, even where they are abundant, may reduce the production of swine.

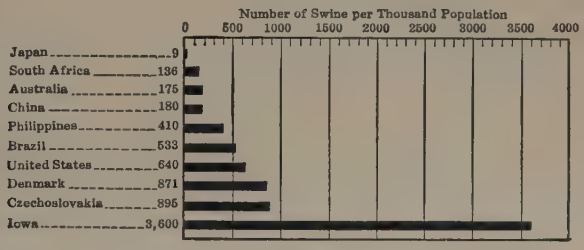


Fig. 76.—Swine per Capita in Representative Regions.

This happens near Chicago where corn is relatively more costly than farther from the great cities.

The disagreeableness of the pig is another reason why its distribution differs so much from that of man. In cities and towns all over the civilized world vast amounts of garbage which might profitably be employed for feeding swine are taken to rendering plants where the fats are extracted, or are disposed of as fertilizer or otherwise, because people object to the smell of pig pens. Although no exact information is available, the religious prejudice against swine may have arisen in part because the animal is disagreeable, and in part because the fat meat has high heating power and is not adapted for human food in warm climates. The fact that swine are tabooed by Mohammedanism, Judiasm, and Hinduism accounts largely for their absence throughout most of Asia and Africa. It may explain the curious area of few swine where old Poland projects into what was formerly Germany and Austria. (Fig. 75). At any rate, that region has long contained a large and influential population of Jews who were formerly forbidden to enter "Great Russia" farther east, but were tolerated in Poland and the neighboring provinces.

In China there is no prejudice against swine and they are kept in

almost every village. Nevertheless, the number is not so large as is often supposed. Unlike draft animals which rely on grass, the swine, so to speak, competes with man for food. A very dense and poverty-stricken population cannot afford to feed swine on anything that people can eat. In China it would be almost criminal to use corn, barley, potatoes and skim milk for such a purpose. Hence swine must be content with the scanty materials which even the poorest Chinese cannot eat, or else with what they can grub up in fallow gardens and fields.

The Distribution of Sheep and Goats.—If the world were limited to four domestic animals the choice would probably be horses, cattle, swine, and sheep. Nevertheless, sheep (Fig. 14) are generally crowded out of regions where population is numerous and intensive farming is practiced, whereas horses and cattle are most numerous in such regions. One reason is that sheep are better adapted than horses or cattle to dry and rugged regions. They can thrive on grass so short that the other two animals cannot bite it off, and they can graze on slopes more comfortably than other domestic animals except the goat. Another important reason is that although wool is highly valuable, it is not so essential as are animals for draft purposes, milk, and meat. Again sheep can be raised and fattened on grass alone. Moreover, wool is one of the easiest of animal products to raise and to transport. Sheep require only a few people to care for them; their wool can be washed and clipped, and then transported vast distances without further treatment and without special precautions such as are needed for meat. Since other animals are almost everywhere available for meat, the sheep of Australia and South America were long kept entirely for their wool. Their extreme helplessness likewise causes the distribution of sheep to differ from that of people. Such helplessness makes the animals need shepherds, but it is unduly expensive to provide shepherds unless large numbers of sheep are kept. That in turn demands large open areas such as exist chiefly in countries that are sparsely populated because of newness, aridity, or ruggedness. In many parts of the United States where settlement is dense and the enclosures relatively small, sheep cannot be kept without a shepherd unless placed in enclosures so well fenced that dogs cannot get in and kill the defenseless creatures.

For all these reasons sheep tend to be animals of the marginal areas. That is why they are especially numerous in four southern areas —New Zealand, Australia, South Africa, and the Argentine-Uruguay section—and in certain European centers, namely Britain, the Balkans, and southern Italy. The southern areas are all newly settled regions

where land is still available for uses like sheep-raising, even though this would not pay if the farms or ranches were small. When the population becomes so dense that the holdings are small, and there is a market for milk, vegetables, and other farm products, sheep give way to cattle and general farming, provided such farming is feasible. In Australia and South Africa, as a matter of fact, most of the sheep are raised on land so dry that if it were devoted to general agriculture, the farmers would be in great danger of frequent and severe crop failures. The same is true of considerable parts of Argentina.

In the Balkans, southern Italy, Sicily, and other Mediterranean lands, sheep are numerous because long experience has proved that it does not pay to try to farm the dry hillsides, or to raise cattle on them. The prolonged summer droughts put these regions near the limits so far as other modes of getting a living are concerned, and thus make it profitable to raise sheep. In Britain a combination of climatic, economic, and social conditions produces a unique condition such that horses, cattle, and sheep are all numerous in almost the same regions. But even there the sheep are abundant largely because Britain is almost too cool and moist for profitable farming. It does not pay to farm large portions of the country so long as food can be brought across the seas in exchange for manufactured goods. Thus even Britain bears out the idea that sheep are relatively marginal animals.

Goats bear to sheep much the same relation as asses to horses, and Brahman to European cattle. They supplant the more valuable type in regions that are especially dry or rugged. In one important aspect the relation between goats and sheep is the reverse of that between Brahman and European cattle. The goat is a much better producer of milk than is the sheep. An average cow yields three or four thousand pounds of milk per year; the nanny goat from five hundred to one thousand, and the average ewe less than one hundred. Hence in relatively dry countries like South Africa, northern India, Mexico, and the Mediterranean lands, especially Greece and the Balkans, where goats reach their greatest density per square mile, they may replace the cow as a source of milk. In that case the distribution of goats becomes much like that of the people. In the eastern Mediterranean lands, both the goat and sheep are kept largely in the villages. This is possible because the dryness of the summers and the general ruggedness cause waste land to be abundant. The unfenced grain fields can be used for summer pasturage, for the harvest is usually finished by June. Moreover, the standards of living are so low that children do not go to school and the village boys can be employed to herd the goats and sheep, thus making fences unnecessary.

The Widespread Distribution of Hens.—The last two domestic animals which it is worth while to discuss here present a marked contrast. The hen possesses most of the qualities that cause an animal to be widespread; the silkworm goes to the opposite extreme. The qualities that make hens widespread include: (1) relative independence of climate, perhaps because hens were derived from several wild ancestors in different parts of the world; (2) a cosmopolitan attitude toward food, so that, like the pig, they can thrive almost anywhere on all sorts of food, including garbage; (3) the products for which hens are chiefly valuable cannot easily be transported. The small size of the individual animal makes slaughtering, cold storage, and transportation relatively expensive when fowls are used as meat. As for the eggs only in our

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 77.—World Map of Poultry.

own day has there been any extensive attempt to transport them long distances. Even now, as a regular thing, dealers expect to lose somewhere near 15 per cent by breakage. Moreover, freshness is a very important quality which is soon lost by transportation.

The net result is that the distribution of hens (Fig. 77) is much like that of farms all over the world, except in two respects. First, the lower the stage of civilization, the smaller the number of hens per capita and per square mile, as appears from their relative scarcity in tropical countries. Second, hens tend to be especially numerous in favorable localities near great markets as in eastern Pennsylvania and New Jersey, and in regions with an especially good supply of food, as in the Corn Belt of the United States from Ohio to Iowa.

In most countries, ducks and geese are insignificant compared with hens; but in the Low countries of Europe, in Japan, and especially in

China, they rise to real importance. The regions where this happens have abundant water in canals for irrigation or other purposes. Where rice is raised, domestic waterfowl are especially likely to be abundant, as in South China where they are often herded by small boys who drive them with long sticks as readily as the shepherd boys of western Asia drive their sheep. As soon as one leaves the ricelands of China and reaches a section so cold that the water courses are frozen for some time in winter, ducks and geese decline greatly in number.

The Limitations of the Silkworm.—The silkworm is peculiarly interesting because it illustrates how the distribution of domestic animals is expanded by man and limited by nature. The silkworm was first raised in China, but spread to India, Persia, and finally the Mediterranean lands, where it reached its maximum profitable expansion. Efforts were made to introduce it into England, Mexico, and colonial Virginia. As late as the American Revolution, Benjamin Franklin was engaged in a silk enterprise in Philadelphia, while in 1866 California was offering bounties for the cultivation of silk. All these efforts proved abortive for reasons that we shall now discuss.

On the one hand, the silkworm is subject to very strict geographical limitations. On the other hand, the durability of raw silk and its high value—over seven dollars a pound on the New York market from 1921 to 1924—make the cost of transportation negligible, so that there is little incentive to overcome the geographical limitations. The first limitation is set by the mulberry tree. No other easily raised tree provides leaves on which the silkworm can thrive. The various species of mulberry grow in the warmer parts of the temperate zone and in semi-tropical regions, but do not thrive in equatorial regions except on the mountains. With proper care they can be raised in climates as cool as those of Philadelphia and southern England, but thrive better somewhat farther south. Thus the mulberry tree limits silk cultivation to a zone lying roughly between latitudes 15° and 40° on either side of the equator, although in Europe and western America the limit rises to about 45°.

The next limit is set by standards of living and habits of industry. The rearing of silkworms is a very painstaking and laborious occupation requiring great concentration during a short season. Fresh leaves must be cut daily with absolute regularity; the trays on which the worms are kept must be cleaned; the air must not be allowed to become too close and hot, or too cool. The labor must be cheap or else the cost of production will be greater than the market can stand. Such labor is found only among people with low standards of living combined with established habits of great regularity and industry. In America no

such labor has ever been available on a large scale, for the Indians do not display the steadiness which is so pronounced a characteristic of the Chinese and Japanese, for example, while European labor in America has always been expensive. The Negroes, to be sure, might supply the necessary labor, but the demand for their work in other lines, especially cotton-raising, is so great that their labor is more expensive than that of the regions where silk is actually raised. Only in such places as Japan, China, northern India, Persia, and the Mediterranean lands does one find such labor, and those are the regions whence comes our silk.

Another natural limitation is the degree of moisture during the season when the worms are growing. In regions with the Mediterranean type of climate, unless irrigation is practiced, there is always danger that the rainy season will end too soon, so that fresh mulberry leaves will be scarce. In China and Japan, on the contrary, the rains come in summer, so that fresh leaves can be procured for many months instead of only a few weeks. In such places the dangers from the many diseases to which the silkworm is subject are indeed increased, but this does not offset the great advantage of China and Japan in their rainy summers, as well as in their labor supply.

Finally, the work of silk raising is likely to be still more limited in the future by the fact that some varieties of silkworms produce only one generation per year, that is, the eggs laid one spring hatch the next, but other varieties are bivoltine, that is, the eggs laid in the spring hatch in a few weeks, and another set of worms is raised the same year. Still others are multivoltine, so that several generations are raised in a year. Already modern science appears to be able to produce varieties whose eggs can be hatched whenever desired, so that worms may be available at any season. Thus silk raising is changing from an occupation requiring many unskilled people for a few weeks in the spring to one where high skill is required among the technical workers who use the microscope to examine the eggs, while the unskilled workers can be kept busy as long as fresh mulberry leaves are available. Hence a region like South China, so warm and moist that the mulberry tree sends forth leaves much of the year, has a great advantage over Mediterranean lands where the growth of the trees is limited both by low temperature in winter and drought in summer, or even over Japan with its cool, but not cold, winters. Naturally the silk industry is diminishing in the Mediterranean countries, and growing in Japan and China, especially South China. As methods of transportation and storage become still better, and as peace and international harmony become more fully assured, the distribution of all sorts of products, including plants as well as animals, tends to go through the same process as silk. First, the area where the

product is raised tends to expand; then it contracts, and production becomes intensified in the most favorable areas.

EXERCISES AND PROBLEMS

1. How well is the climate of your home adapted to cattle raising? Get data as to the monthly mean temperature and rainfall of your home. Prepare a diagram like those of Fig. 74. Which part of Fig. 74 does it most resemble? How does it differ from that? State your conclusions as to the adaptability of your home region for cattle in comparison to the adaptability of the places in Fig. 74. Compare the number of cattle in your state, the number per square mile, and the number per capita, with the corresponding figures for neighboring states and with the data in Fig. 67. How far does this comparison support your conclusions based on the climate?

2. From Table 14 make 10 lists showing the four countries that stand highest in horses, cattle, swine, sheep, and chickens, respectively, per square mile and per capita. How far are the same countries repeated? What does this signify? Which of your 10 lists are most unlike the others? Why? Make a similar set of 10 lists of the states and provinces of the United States and Canada. (Tables 18 and 19.)

3. Examine the countries that devote more than 35 per cent of arable land to grass and forage (Table 9). Which animal dominates in each country? Explain.

4. From Table 11 (last column) select the four countries of highest productivity and the four of lowest productivity. Ascertain the animal raised in largest numbers in each country. Does there seem to be any general relation between the type of animal and the productivity of crops?

5. Compare six states of greatest farm value per farm with six of low farm value (Table 10). How do the numbers of animals per capita and per square mile (Tables 18 and 19) and the prices (Table 20) compare in the two sets? Do you see any significance in this result?

6. Make a dot chart of the relation between the number of swine per capita (Table 19) and the corn raised per capita (Table 16) in the United States. Use Fig. 27 as a model. For convenience omit the last figure in the swine table and the last two in the corn table. Put merely a dot for each state except where the number of swine is more than 5 per capita (500 per thousand inhabitants as given in the table). Remember that if the points of such a diagram cluster near a line, either straight or systematically curved, a close relationship is indicated. What do you infer as to the closeness of the relation between the amount of corn and the number of swine per capita. Make a similar dot chart for poultry and corn per capita.

7. It is sometimes supposed that horses and oats are related in much the same way as swine and corn in the United States, since oats are largely raised as horse feed. Test this supposition by making a dot chart of horses per capita (Table 19) and oats per capita (Table 16). Insert a dot for each state and add names of states where the per capita number for horses is more than 0.4 and for oats more than 2.0. What do you infer from the following features of your chart: (1) the position of the Dakotas; (2) the similarity of Wisconsin and Montana in the production of oats per capita and the contrast in the number of horses; (3) the great number of spots on the left-hand margin of the diagram?

CHAPTER XV

DISTRIBUTION OF CEREALS

Main Factors in Crop Distribution.—The distribution of crops depends upon numerous conditions, which often act in contrary directions. Chief among these are (1) climatic limits and optima; (2) soils; (3) relief; (4) density of population and stage of culture; (5) value of the crops as food for man, feed for animals, or raw material for manufacturing; (6) productivity as measured by the yield per acre or the results of a given amount of work; (7) ease of preparation for market, keeping qualities, bulkiness and other qualities which influence transportation; (8) accessibility of markets; (9) relation to other crops and animals, as to space required on the farm, demands for fertilizers, and amount and season of labor; (10) human habits, customs, and prejudices, including such conditions as tariffs.

The Main Types of Crops.—The world's great crops, as listed in Table A, fall into the following groups:

A Cereals	B Fresh foods	C Other vegetable foods	D Stimulants and narcotics	E Animal feed	F Raw materials
Rice	Garden vegetables	Potatoes	Grapes (wine)	Hay	Cotton
Corn	Apples	Sugar	Tobacco	Forage	Flax
Wheat	Grapes	Sweet potatoes	Tea	Corn	Rubber
Oats	Berries	Dry beans	Coffee	Oats	Flaxseed
Rye	Orchard fruits	Dry peas		Barley	
Millet	Citrus fruits	Peanuts		Potatoes, etc.	
	Bananas	Olives			
		Coconuts			
		Cottonseed			

Among the crops that provide food for man, the cereals easily hold the first place. Wherever civilization is even moderately advanced, either rice, wheat, corn, oats, rye, barley, or millet is usually the most important food crop. Other food products, however, are necessary to provide vitamines, acids, and salts. Moreover, under certain conditions more food per acre can be procured from crops like potatoes and sugar than in any other way. Hence vegetables of all kinds stand next to

cereals as a source of food. Fruits supply many of the same elements of diet as do fresh vegetables. Their flavor alone is enough to cause them to be raised on a large scale. The cereals, vegetables, and fruits provide a diet on which mankind can apparently thrive indefinitely. Nevertheless, aside from beans, peas, and other legumes, which are cultivated, especially for proteins, these kinds of food usually furnish an unduly large percentage of carbohydrates in the form of starch and sugar, whereas their protein content is usually low. Domestic animals, on the other hand, furnish foods with a high protein content and likewise furnish highly valuable raw materials. Accordingly, a large percentage of the world's crops is used as feed for animals, especially in regions that are highly prosperous and progressive, and can afford the luxury of abundant milk, meat, and eggs. In such regions hay, and forage often rank with the cereals and above the vegetables and fruits as objects of the farmers' labor. In addition to genuine foods, all races seem to crave narcotics or stimulants, so that wine, tea, coffee, and tobacco are among the important products of agriculture. Finally, although crops in the ordinary sense supply far fewer raw materials than do animals and minerals, those that they do supply are highly important.

Every farmer and planter is faced by the necessity of choosing not only among the 36 crops or types of crops mentioned above, but among a still larger number of minor kinds. Many types are of course excluded from a given region by climate; a smaller number by soil or relief. On the other hand, in any given area certain staple crops are generally cultivated by practically every farmer. Nevertheless, even in conservative regions the farmers change their crops little by little, giving more space to those that are most profitable, and less to others. This results in a very close adjustment of the crops to the ten conditions mentioned at the beginning of this chapter.

The Distribution of Cereals.—Let us briefly examine this adjustment in the case of the cereals. Some idea of the relative amount of food furnished by a given area of each cereal may be obtained from the following approximate figures showing the average production per acre in the ten countries standing highest in that respect in Table A, and the average value of each crop per acre in the United States at the censuses of 1909 and 1919.*

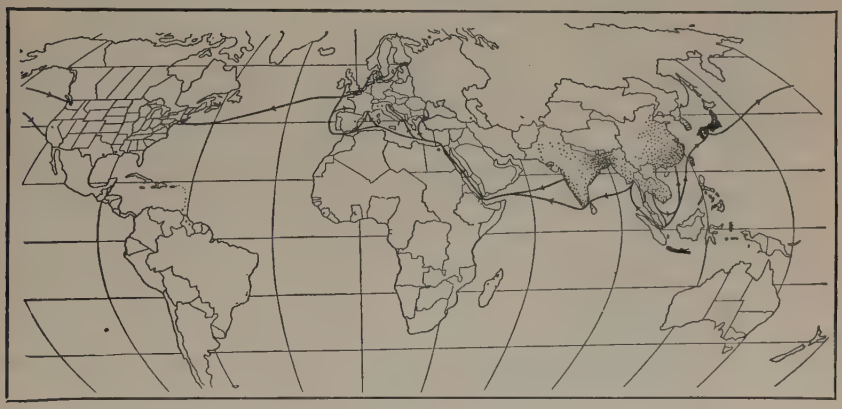
* Rice is here stated in terms of the rough article instead of the cleaned as in Table A. The value of millet is based on data given by the International Institute of Agriculture, Egypt being omitted because its extraordinary yields (four times the average) do not give a fair idea of the real value of the crop. The data for millet are much less reliable than the others.

Crop	Average Yield per Acre in 10 Countries or States with Highest Yield per Acre, Pounds	Value per Acre in the United States, Average of 1909 and 1919
Rice	3,000	$66.45
Corn	2,500	27.30
Wheat	2,000	21.61
Barley	1,900	18.40
Millet	1,700	15.78
Oats	1,600	17.15
Rye	1,500	12.24

The order in the two columns is the same except that millet stands above oats in the first column and below in the second. The value of corn is increased by the fact that the stalks make good forage, while that of rye and rice is enhanced because of the strength and pliability of the straw; but these are minor matters. The outstanding fact is that if all the cereals could be grown in a given region with equal ease, rice would presumably be first choice, then corn, and wheat, with barley, oats, millet, and rye following behind. So far as climate and soil permit, this appears to be nearly what happens. Many factors do, indeed, make it desirable for the majority of farmers to cultivate a variety of crops including two or three cereals. Nevertheless, wherever rice can be grown easily it generally gets most of the space, unless it competes with a still more profitable crop like sugar. Where corn yields good crops, but rice will not grow, corn tends to get the lion's share of the land devoted to cereals; where neither rice nor corn is profitable, farmers generally give first choice to wheat, provided it will grow well.

The Distribution of Rice.—Even though rice is not so good a food as wheat, its high yield per acre tends more and more to cause it to be raised wherever the summers are long enough and the water supply sufficient. At least four months with an average temperature of 75° F. are needed to insure good crops, but the value of rice has led to some cultivation of it where lower temperatures prevail, for example in northern Japan and the Po Valley of Italy. The great bulk of the world's rice is raised in places which combine high temperature and abundant rains. That is why southeastern Asia from India to Japan, together with the East Indies Islands, is the world's great rice region (Fig. 78). The heavy monsoon rains of summer on the mainland and in Japan, and the tropical rains of the more equatorial regions give plenty

of water. The high mountains also help, by condensing the moisture from the air and feeding great rivers like the Ganges, Brahmaputra, and Yangtse, whose waters can be spread over vast plains covered with diked fields. Similar conditions, although less favorable, are responsible for the increasing cultivation of rice along the lower courses of the Nile, Po, Mississippi, and Sacramento rivers. As population increases there is more and more tendency to substitute rice for other crops wherever possible, or to reclaim flood plains, especially river deltas, and devote them to rice. In the five-year period centering in 1900, the United States, for example, produced on an average only 263 million pounds of cleaned rice per year; from 1920 to 1924 it averaged about



Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 78.—World Map of Rice.

1103 million, an increase of approximately 320 per cent. Corn, on the other hand, increased only about 45 per cent, and wheat 32 per cent.

By no means all the lands well adapted to rice are yet used for that crop. Rice culture, as will be shown more fully later, requires more industry and intelligence than is yet possessed by many tropical people such as those of large parts of Borneo, New Guinea, central Africa, and the basins of the Orinoco, Amazon, and upper Plata in South America. If the soil should prove fit, or if it can be made fit by proper drainage, fertilization and plowing, the rice map of a century or two hence will perhaps be as heavily shaded in those regions as southeastern Asia is in Fig. 78. Among the world's undeveloped resources few are greater than the level lands and wasted waters which might be devoted to rice in South America.

The Corn Crop.—Corn is something like rice in its need of abundant warmth, water, and sun, but it does not require so long a growing

season, nor so much water. Hence, Fig. 79 shows that, while corn is raised in great abundance in many tropical countries, it is most abundant in certain non-tropical areas like the central and southeastern United States, Italy, Hungary, Rumania, and north central Argentina. In Mexico, where rice was unknown until relatively recent generations, and where its cultivation is difficult because of the altitude and roughness of many parts and the scarcity of running streams in places like Yucatan, corn is overwhelmingly the chief crop, just as is rice in Bengal. In tropical regions corn is raised almost wholly for human food, but in non-tropical regions its importance in this respect decreases as the

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 79.—World Map of Corn.

scale of living rises, for wheat is a better food. In the northern United States, only a small fraction of the corn is used for man, the rest being fed to animals, especially swine and poultry, and to a less degree to cattle and horses.

In order to understand the real importance of a crop it is advisable to consider not only its general distribution, but its relative importance as measured by both acreage and value. A comparison of three maps of corn in the United States is illuminating in this respect. Fig. 8 shows the total amount of corn. It illustrates how corn occupies the very heart of the best agricultural region, the part where climate, soil, and relief are all most favorable. Fig. 80, however, shows that in spite of a small total production, as indicated by the scarcity of dots in Fig. 8, the states of Georgia, Florida, and Alabama devote as large a percentage of their improved land to corn as do Indiana, Illinois, and Iowa. On the other hand, the relative value of the corn crop in the southeastern states (Fig. 81) is often scarcely a third as great as in the

Corn Belt. In Iowa, north central Illinois, and northwestern Indiana, practically half the value of all crops is represented by corn. The rapid decline in the relative value of the corn crop northward and westward is due to low summer temperature on the north and lack of rain on the west. Eastward, the decline has little to do with climate, for climatically Pennsylvania and Connecticut are only a little less adapted to corn than is Iowa. The soil, however, has a good deal to do with the matter, for it becomes relatively poorer as one passes eastward from the dark prairie soils to the paler soils of the East. Another

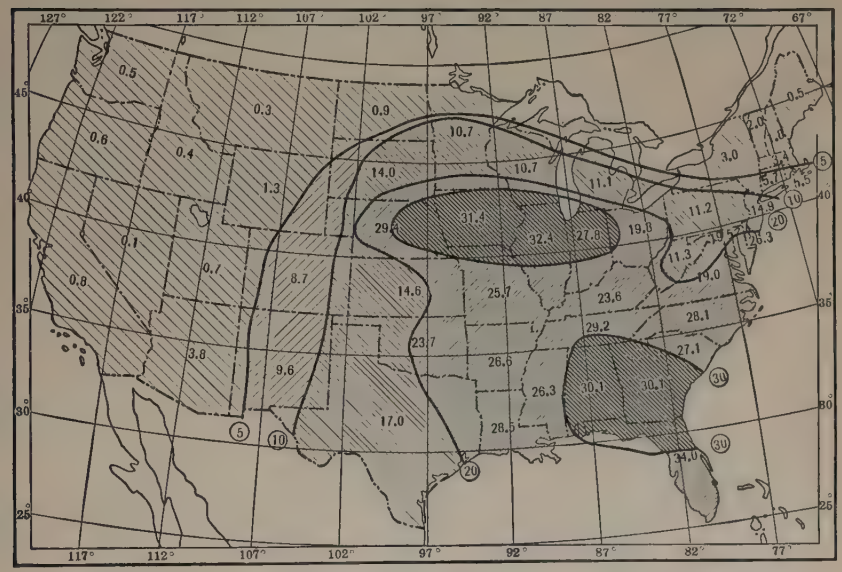


FIG. 80.—Percentage of Improved Land Devoted to Corn. Average of 1909 and 1919.

important fact is the increasing density of population. This causes truck crops, fruit, and forage crops for dairy cattle to assume more importance and to get a large percentage of the best land. Even when field corn is raised, it is largely cut for silage. Relief enters into the matter only slightly, for here we are considering how the good land is used, and not how much there is of it. The fact that the relative value of the corn crop declines southward as rapidly as eastward likewise has little to do with any direct effect of climate, although the longer period of warmth and moisture favors the development of rusts, smuts, blights, and insect pests. More important factors are the southward decline in the quality of the soil, a similar decline in methods of cultivation,

and the fact that cotton, because of the greater value of its yield per acre, usually gets the best land and the best care. The net result is that the yield of corn per acre in Georgia (1921–24) averaged only 12.9 bushels per acre against 38.9 in Iowa. In Florida, where the yield of corn is only 13.8 bushels per acre and where practically no cotton is grown, corn does indeed tend to get the richest soil, as we have already seen, but on the other hand truck crops and oranges yield very high values per acre, thus lowering the importance of the corn crop in proportion to other crops.

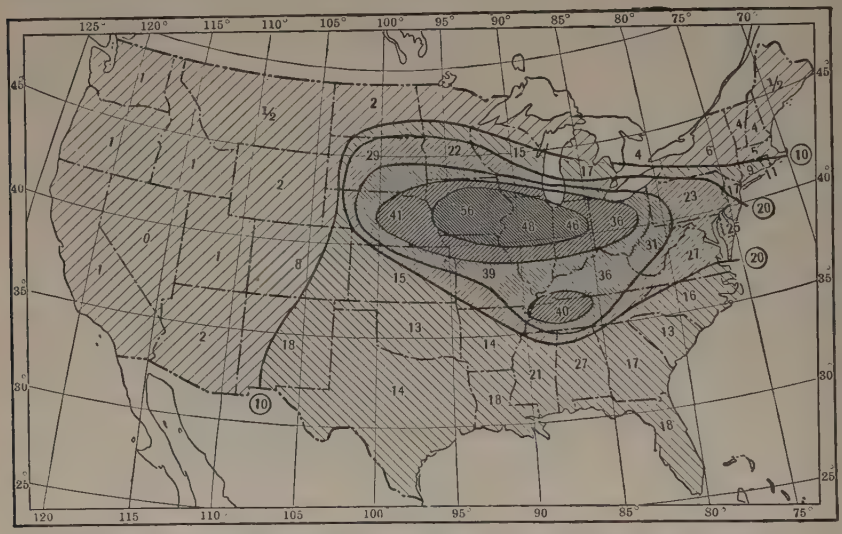
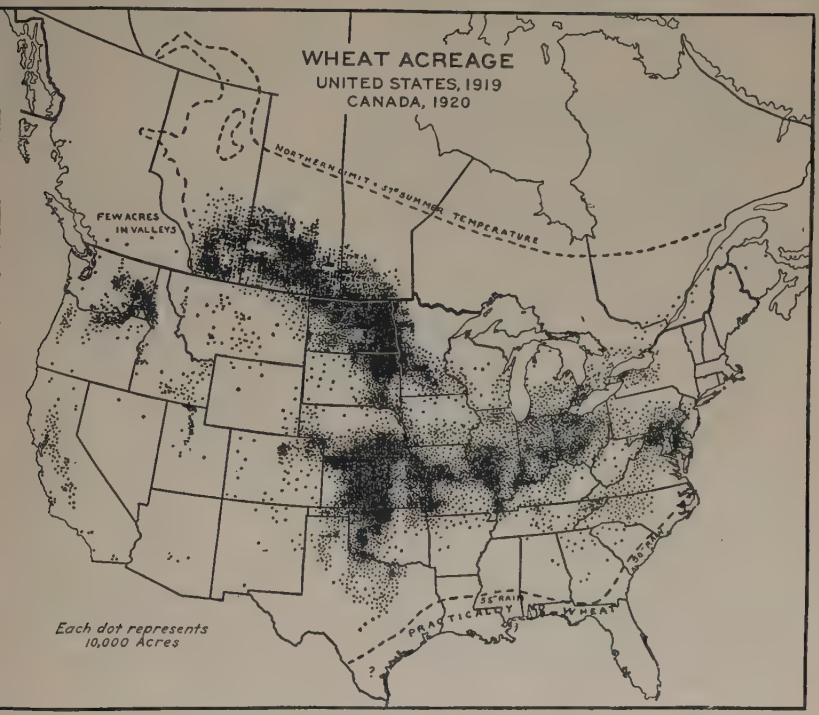


Fig. 81.—Percentage of Value of All Crops Furnished by Corn in 1919.

The Distribution of Wheat.—In Fig. 82 the great North American wheat region is split into two areas, hard spring wheat to the north, and softer winter wheat to the south. This suggests that the two kinds of wheat have distinct climatic requirements which is true, but in an intermediate type of climate both kinds can be raised profitably. In eastern Washington and Oregon, for example spring wheat is dominant in the northern part of the area of heavy shading in Fig. 82, and winter wheat in the south, but both are raised together in the center. In eastern Russia, likewise, along a line running roughly from Odessa to Riga, the winter wheat which gives western and southern Europe their dark shading in Fig. 3 overlaps the spring wheat which is the dominant type in southeastern Russia and Siberia. At the foot of the Caucasus Mountains both kinds are again grown, for a milder climate brings in winter wheat once more. Thus in other parts of the

world the intermediate belt where both winter and spring wheat are profitable is a great wheat area. Why then should this area raise very little wheat in Iowa and neighboring areas between the two main wheat-raising regions of North America? Soil and the relative values of wheat and corn are the main reasons. The wonderfully rich, dark prairie soils whose effect we have already seen in central Illinois extend over into Iowa, eastern Nebraska, and South Dakota. In conjunction



Courtesy of O. E. Baker and Economic Geography.

FIG. 82.—Wheat in the United States and Canada.

with the warm rainy summers which stimulate growth, and the cold winters which help to keep down insect pests and fungus diseases, the soils make both corn and oats highly profitable. Hence they almost drove out wheat. In Fig. 83 it appears that in Iowa the percentage of the value of all crops represented by wheat drops to only 5 per cent as opposed to about 50 in Kansas on the one side and North Dakota on the other. If there were no such thing as corn, Iowa's soil, climate, and relief might make that state the banner wheat raiser. On the other

hand, if North Dakota were warmer and moister, its wonderful plains of dark soil might make it rival Iowa in producing corn.

The almost complete absence of wheat south and southeast of Tennessee is to a large extent the result of climate. The warm, moist summers make it difficult to raise wheat profitably, while they are favorable to both corn and cotton. These crops are so profitable that there is little incentive to raise wheat and to develop varieties adapted to such a climate. West of Arkansas, however, the greater dryness favors wheat and hampers corn and cotton so that wheat becomes a crop

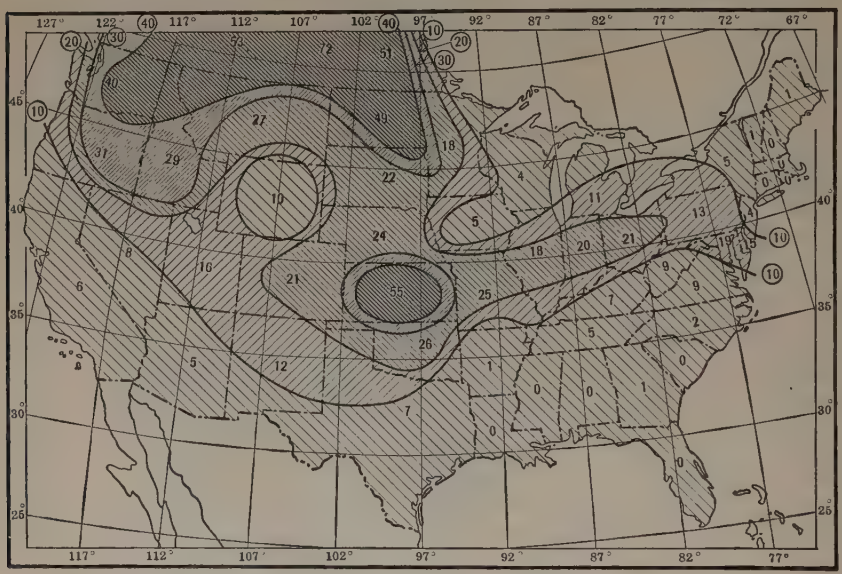


FIG. 83.—Percentage of Value of All Crops Represented by Wheat.

U. S., 1919. Canada, 1922.

of some significance even in California, which raises an extraordinary variety of profitable crops grown in practically no other state except Florida. The controlling effect of soil as well as climate is well seen in western Oklahoma, where a belt of dark-brown fertile soil causes both wheat and corn to be more abundant than farther east, in spite of lower rainfall. But the lower rainfall and its greater irregularity in the west than in the east of the state do more harm to corn, which grows in summer, than to wheat, which grows in the cooler season.

Europe (Fig. 3) produces over half of the world's wheat crop. Wheat occupies 30 per cent of the area devoted to cereals, and is the most important crop of the continent, just as rice is in Asia, and corn

in North America. The heaviest producing areas are southeastern England, northern France, central Germany, the plain of Hungary, and the Po Valley. England produces nearly 33 bushels per acre, Russia scarcely 9 (Table 12). Nevertheless, under normal conditions, Russia exports more than do the European areas of greater productivity. The reason is that western and central Europe contain not only a fairly dense agricultural population, but also a large industrial population which consumes the surplus wheat raised locally. Moreover, the standards of living are high, so that the farmers largely eat wheat bread, except in Germany. In Russia, on the contrary, the industrial population is negligible, the standards of the farmers are low, there is almost no cash crop except wheat; hence the tendency to export most of the crop.

Among the other areas that produce much wheat for export, northern India has a surplus for the same reasons as Russia, although the yield per acre is not much larger (11.6). The other three, Australia, Argentina, and the great plain of the United States and Canada, also have low yields per acre, namely 12.6 in Argentina, 13.5 in Australia, 14.1 in the central plains of the United States, and 15.9 in the neighboring part of Canada. They all have high standards of living, and the farmers generally use the best food obtainable. Nevertheless, these regions have a large surplus for export because they are new lands with a scanty population where the farms are large, the level plains lend themselves to easy agriculture, a high stage of civilization has led to a remarkable development of machinery for planting, harvesting, and threshing, and the labor of a single individual produces a vast amount of wheat. In Saskatchewan the average rural family, counting merchants, mechanics, lumbermen, and all others as well as farmers, produces about 80,000 pounds of wheat per year; in Java where rice occupies essentially the same preponderating place that wheat does in Saskatchewan, but where the population is dense and the farms small, the similar family produces only about 2300 pounds of rough rice. The real contrast is greater, for the Javanese are engaged in agriculture more completely than the people of Saskatchewan. Small wonder, then, that Saskatchewan, with a rural population of not much more than half a million, is a huge exporter of wheat, whereas Java with nearly 30,000,000 such people actually has to import rice for its own population. The human factor counts for much more than the bounty of nature in determining the source of the world's commercial food supplies.

Oats as a Substitute for Other Cereals.—The four minor cereals, oats, rye, barley, and millet, become the dominant cereals mainly in regions where climate and soil make it difficult to raise rice, corn, or

wheat. Oats, to be sure (Fig. 84), have a special value of their own because they are one of the best of all foods for both men and horses. They do not keep so well as some of the other cereals, however, and are too bulky to stand much transportation. Yet they are so good for horses that they are widely raised all over the United States and Europe even where other cereals would be more profitable if sold on the market. That is one reason why Iowa raises far more oats than any other state or province in North America. Having the largest number of horses, it needs the most oats.

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 84.—World Map of Oats.

Aside from their use for animals, oats become of high *relative* importance mainly in the limited areas which have such cool summers that corn will not grow and wheat is at a disadvantage. In every province of Canada except Nova Scotia and British Columbia, oats are one of the three most valuable crops. In Winnipeg and Saskatchewan they provide about a fourth of the total value. But nowhere in the United States do they fall among the three most valuable crops, except in Iowa where they furnished 16 per cent of the value in 1919. In northwestern Europe, on the other hand, in the countries where the July temperature averages under 63° F., the land devoted to crops is used in the following way:

	Acres		Acres
Hay and Forage	10,750,000	Wheat	494,000
Oats	4,820,000	Flax	131,000
Rye	2,280,000	Peas	95,000
Barley	2,020,000	Sugar-Beets	80,000
Potatoes	1,430,000		

These figures include Ireland, Denmark, Norway, Finland, Esthonia, and Latvia. They show that where the summers are cool, oats become far the most important cereal. They are used as food for man on a large scale. But they are also used in large quantities for animals, whose abundance may be inferred from the great percentage of the cropped land devoted to hay and forage. Incidentally it is interesting to note the other crops associated with oats in regions having cool summers. Aside from hay and forage, the only important ones are rye, barley, potatoes, a little wheat, and insignificant areas of flax, peas and sugar beets.

Barley, the Crop of Dry Summers.—Just as oats are the crop which replaces wheat and corn where the summers become cool, so barley (Fig. 85) replaces them where the summers are dry. This appears in the relative abundance of barley in California, southeastern Russia, and especially the lands around the Mediterranean. In 1919 California produced 18 per cent of the total barley crop of the United States (22 per cent on the basis of value), whereas it produced only 2 per cent of the wheat, a quarter of 1 per cent of the oats, and a sixth of 1 per cent of the corn. The same thing is illustrated by the following contrast between North Africa and France. In the French provinces of Tunis, Algeria, and French Morocco, the dry summers induce farmers to devote practically as much space to barley as to wheat. In France, on the contrary, the wetter, cooler summers make it pay to raise a large supply of oats, and relatively little barley.

Percentage of Land in Cereals Devoted to	North Africa	France
Wheat	46½	48
Barley	45	6
Oats	5	31
Corn	3	3
Rye	....	8
Buckwheat	....	3

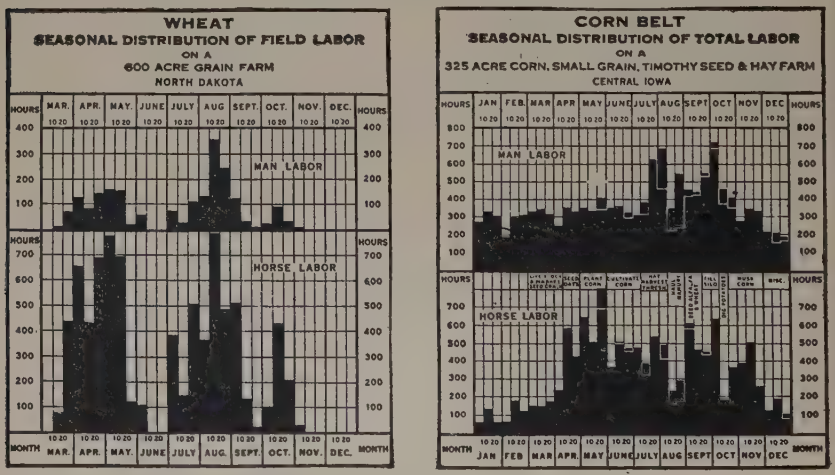
Barley, like oats, is good for animals. Therefore it is raised in many places along with wheat or other cereals. On the majority of farms it pays to raise two or three cereals, even if all of them are not especially profitable, or are not the ones best adapted to the soil. This is advisable for the following reason: (1) Diversity of crops is highly desirable to guard the farmer against disaster due to bad weather, insect pests, and the like. (2) Even a cheap cereal like rye has certain specific

uses in which it excels others. (3) Different crops ripen at different times. Hence a proper combination of crops keeps the farm hands

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 85.—World Map of Barley.

and animals busy at times when they would be idle if only a single crop were raised (Fig. 86). Such conditions cause certain areas like Iowa and



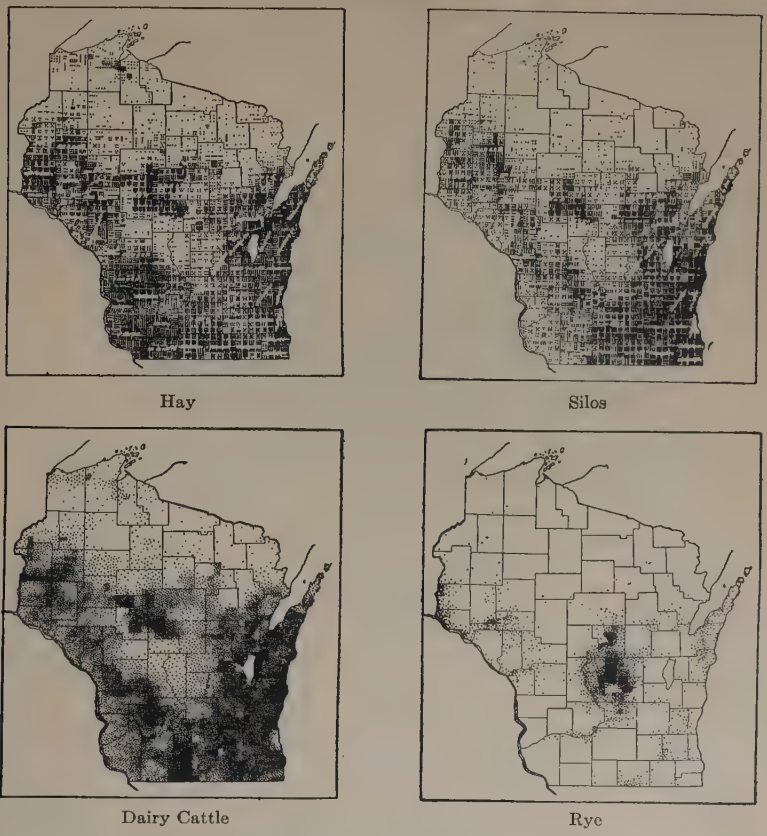
Courtesy of O. E. Baker and U. S. Department of Agriculture.

FIG. 86.—Seasonal Distribution of Work of Men and Horses on Corn Farm versus Wheat Farm.

France to be fairly abundant producers of most of the cereals. For this reason, maps of wheat, oats, and barley, and even of corn and rye, show certain resemblances which sometimes obscure the important

fact that one cereal tends to replace another according to the conditions of soil and climate.

Rye, the Crop of Poor Soils.—Just as oats are a substitute for wheat where the summers are especially cool, and barley where they are dry, so rye is a substitute where the soil is poor, provided the summers are

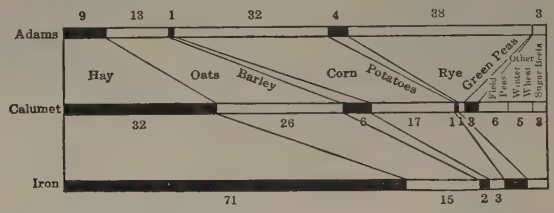


Courtesy of Wisconsin Crop and Live Stock Reporting Service.

FIG. 87.—Effect of the Soil in Wisconsin.

fairly cool and moist. We have already seen an illustration of this in the increased percentage of rye as soon as one proceeds south of the good soil in central Illinois (Exercise 1, Chapter VI). Wisconsin furnishes a still more vivid illustration. One section of Fig. 87 shows the distribution of rye. The most notable feature is a patch of great density near the center of the state. The next figures (*B–D*) indicate that hay, silos, and dairy cattle, which furnish 55 per cent of the gross income of Wisconsin farms, are scarce just where rye is abund-

ant. The same is true of wheat, oats, corn and even barley, while the value of farm land likewise drops very low where rye is abundant. In Adams County, the least favored part of the rye area, farm land averages only $25 per acre in contrast to more than twice as much on all sides, and four or five times as much a little farther east. All of these contrasts are due in large measure to the soil. The reason for the poor quality of the central soils is largely that the underlying rock is sandy and deficient in plant foods. Fig. 88 shows how differently the land is used in Adams County and in Calumet County eighty miles farther east, where the farm land is worth nearly five times as much. The climate in the two counties is almost identical. The topography may partially explain why corn receives twice as large a percentage of the total cereal area in Adams County as in Calumet. but the rougher topography of Adams County can have little effect



From Wisconsin Crop Reporting Service.

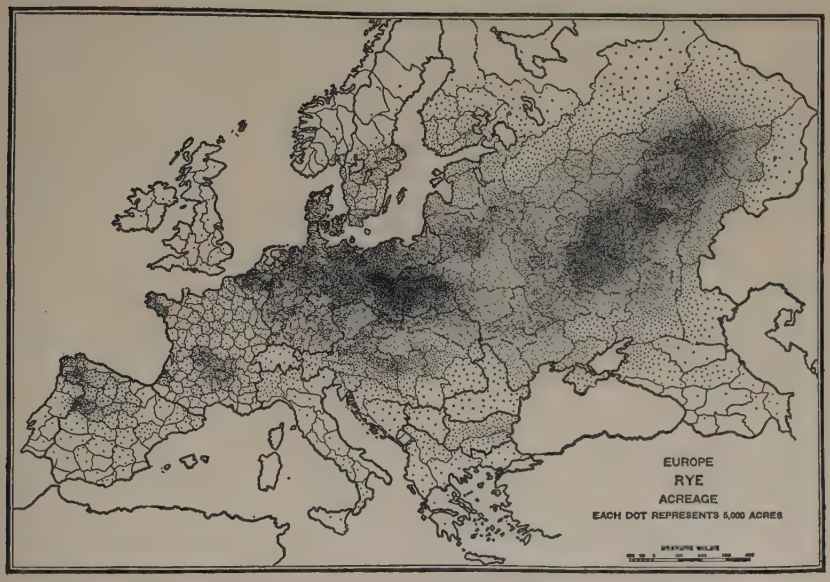
FIG. 88.—Effect of Soil and Climate on Crops in Wisconsin Counties.

Adams, a southern county with excellent climate but poor soil; Calumet, a southern county with excellent climate and soil; Iron, a northern county with poor soil and a climate too cool for corn except as a silage crop. Figures indicate percentage of total cropped area devoted to each crop in 1924.

in causing the choice of rye in preference to the other cereals. On rough land it is no easier to raise rye than wheat or oats. It is the poverty of the soil which causes the farmers to substitute rye for wheat and barley, and raise relatively few cattle.

Rye and the Soil of Europe.—Central Europe, like the rye area of Wisconsin, illustrates the fact that rye is the cereal of poor soils in cool regions. Fig. 89 shows what enormous quantities of rye are raised in Europe, where over 95 per cent of the world's total crop is produced. The cool summer climate is sometimes said to be the reason for this huge production. But Figs. 3, 84, and 85 show that wheat, oats, and barley are all raised in large quantities in parts of Europe having climates fully as cool and unfavorable as those where most of the rye is raised. The fact is that, in the parts of Europe where rye is chiefly cultivated, the soil, as Dr. Marbutt of the U. S. Bureau of Soils puts it, is mainly light in color, low in organic matter and lime, and low to medium in potash and phosphorus. It also has a poor structure or

speedily develops such a structure so that it soon loses its organic matter. Its light color causes it to fail to utilize the full force of the sun's rays in storing up heat. A country with such soils may indeed produce large yields of wheat per bushel. Germany, for example, averages about 27 bushels per acre, but that is because the best land is devoted to wheat. Germany gives to wheat only about the same area as to barley, less than half as much as to oats, and a third as much as to rye. The people of Germany, Poland, and much of Russia, aside



From Geography of World's Agriculture.

FIG. 89.—Distribution of Rye in Europe.

from the southeast, eat rye bread mainly because the soil beneath their feet is poor.

Millet, the Least Favored Cereal.—Millet is such poor food that it is rarely raised for human use where any other cereal will prosper. Nevertheless, it is one of the major sources of food in large parts of India, China, and Africa. Its great advantages are that it grows well in regions with only a short, irregular rainy season, and can stand great heat. On the borders of the Arabian desert one sometimes sees Arabs plowing the sandy soil with camels and planting millet in the hope that one or two good rains will lead to a harvestable crop.

EXERCISES AND PROBLEMS

The exercises and problems for this chapter and the next are placed together at the end of the next chapter.

CHAPTER XVI

GEOGRAPHY OF CROPS OTHER THAN CEREALS

Potatoes as Food Producers.—One of the noteworthy features of Table A is the high position of potatoes and other vegetables. Potatoes are far the most valuable vegetable, largely because of their huge yield per acre. A pound of potatoes, to be sure, supplies scarcely 300 calories of heat in contrast to 1000 or perhaps 1200 for wheat after deductions have been made for the bran, oily kernels, and coarser grades of flour that are mainly fed to animals. But even in France, which is too warm for potatoes, an average acre yields nearly 6 times as many bushels

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 90.—World Map of Potatoes.

of potatoes as of wheat; the corresponding figure stands at 7 in Germany, England, Finland, and the United States, and rises to 10 or 11 in Norway, Lithuania, Poland, and Canada. Potatoes may not be such good food as wheat, but they provide two or three times as many calories of food per acre.

Another important quality of potatoes is that the ordinary variety, being derived from the constantly cool, moist highlands of the Andes, thrives best in climates too cool for corn and too moist for the most profitable wheat culture. The natural result is that Europe, the

continent where the largest percentage of the area has cool summers, produces approximately 90 per cent of all the world's potatoes (Fig. 90). In the continent as a whole, the potato crop falls only a little, if any, below wheat as a source of food, and easily rivals rye or oats, as appears in the following table:

APPROXIMATE PRODUCTION OF CHIEF CROPS BY CONTINENTS IN MILLIONS OF POUNDS

(Data for 1921–24 from Table 11 in Appendix)

	North America	Europe	Asia*	South America	Africa	Australasia
Rough rice	1,076	1,720	287,000	2,120	2680	11
Wheat	75,000	90,000	65,000	14,600	5800	8300
Corn	167,000	29,400	10,000	12,500	6750	440
Oats	56,800	63,000	250	188	620	665
Rye	5,360	69,000	?	151	39	6
Barley	12,300	35,000	12,000	640	4300	350
Potatoes	30,800	274,000	17,000	2,520	350	960

* Including rough estimates for China.

In Germany the importance of potatoes is even greater than in Europe as a whole. Suppose for convenience that we count a pound of each of the unmilled cereals as of equal food value when measured in calories, a pound of sugar as equal to 2 pounds of rough cereal, and a pound of potatoes as worth only one-fourth as much as one of cereal. If all that each country raises were eaten by the people, and none were exported or fed to animals, the relative values of different home-grown articles in feeding the Germans as compared with the Americans would be approximately as follows:

	Germany	United States
Barley	100	100
Wheat	125	578
Sugar	132	54
Oats	256	470
Potatoes	400	102
Rye	450	47
Corn	...	2680

Potatoes would doubtless be raised far more widely, were it not that (1) the crop is especially likely to be spoiled by prolonged rain, (2) potatoes do not keep well in comparison with grains, and (3) they

are bulky and heavy, and cannot economically be transported long distances.

In climates with long, warm summers and plenty of rain, sweet potatoes or yams replace white potatoes, as in the southeastern United States. In southeastern Asia enormous areas are devoted to a purple-skinned yam which is shredded into bits like fine macaroni and dried for winter use.

Sugar, the Great Carbohydrate Crop.—Sugar, Fig. 91, supplies essentially the same human needs as potatoes, and produces even more food per acre. Measured in calories, a pound of sugar is equivalent to nearly 6 pounds of potatoes. In Europe, aside from Russia, an acre of

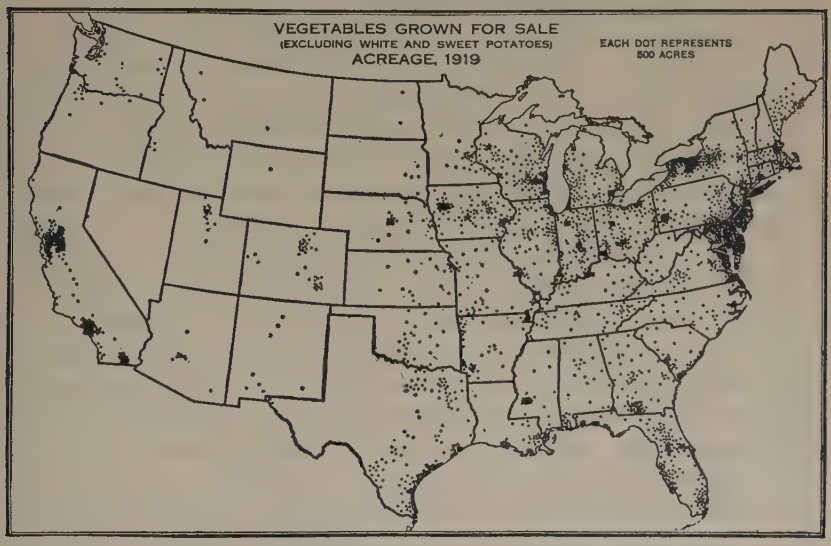
Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 91.—World Map of Sugar.

sugar produces on an average about 18,600 pounds of sugar, and in the United States only a little less. An average acre of cane sugar produces about 21,000 pounds in Louisiana, and over 100,000 pounds in the carefully irrigated and unusually well-managed fields of Hawaii. Naturally then, cane sugar is the sort of crop which receives the utmost attention and is placed on the land best adapted to it. In tropical regions it tends to replace cereals like rice in Java and corn in Cuba, especially on the level well-watered lands near the seacoast. In Java the danger of reducing the supply of staple foods through the exportation of sugar is so great that the government does not allow more than a third of the land in any given area to be devoted to sugar. Nevertheless, Java has to import rice. In Cuba so much of the good corn land is given up to sugar that the Island imports more foodstuffs per capita ($30–$40) than almost any other country. Sugar is the only basic foodstuff, as distinguished from luxuries like tea and coffee, that is

exported in huge quantities from tropical to non-tropical lands. Generally the movement is the other way, a fact which suggests that the problem of the world's food supply is not likely to be solved by developing the tropics. Thus far, the more fully a tropical region is developed by northern races, the more likely it is to be an importer of staple foodstuffs.

Vegetables and Fruits.—Let us apply to other crops the principles of distribution which we have seen illustrated in the case of cereals, potatoes, and sugar. Fresh vegetables yield much food and a high value per acre; they are bulky; they deteriorate rapidly; and they



Courtesy of U. S. Department of Agriculture.

FIG. 92.—Distribution of Farm Vegetables in the United States.

require relatively large amounts of labor. For these reasons they tend to be raised, (1) on the land best adapted to them so that they displace the cereals and potatoes, for example, and (2) as near the centers of population as possible. The land best adapted to vegetables is not necessarily the same as that best adapted to field crops. Thus the warm, light, sandy soil of Long Island and lower Florida, though not good for wheat or corn, is good for crops whose high value warrants intensive cultivation and large expenditures for fertilizers. Again, the optimum climate for vegetables, so far as the truck gardener is concerned, may not be the optimum in the ordinary sense, but the one that enables him to get his crop to the market at the most profitable season. The desirability of planting vegetables as near the centers of

population as possible is due to the advisability of having the gardens near a supply of labor, as well as near the market. These two conditions, together with the high value of the crops per acre, are the main reasons why the farmer puts his vegetable garden on the best bit of land he can find, and yet as near the house as possible. They are also the reasons why the densest shading in Fig. 92 clusters around the main cities and along the Atlantic Coast from New York southward. They also explain why the cultivation of vegetables for the winter market has increased with great rapidity in Florida, where the acreage of vegetables was 2.6 times as great in 1919 as in 1899, and in California, where the corresponding figure is 5.2.

The home supply of fruits, like that of fresh vegetables, is very widely distributed. Its distribution resembles that of the population, except for modifications introduced by soil, climate, and stage of culture. Where the summers are cool and yet of sufficient length, most of the farmers have at least a few apple trees. The same is true of peaches, pears, berries, grapes, oranges, and especially bananas in their respective climates. But only rarely do either fruits or vegetables really compete with the cereals for space, for the areas devoted to them are generally insignificant. Another noteworthy fact is that the commercial production of both vegetables and fruits tends to be highly localized. Thus the production of cabbages centers in the cool Lake States, especially New York south of Lake Ontario, but large amounts are raised on Long Island, and in New Jersey, and likewise on the South Atlantic Gulf coasts where they are raised for the early market. In the same way tomatoes are a great specialty of two regions, (1) New Jersey, Delaware, and Maryland, (2) southern Indiana; while the early crop comes largely from Florida. Apples are especially apt to be important in selected portions of the regions where oats are a great crop, as in the Annapolis Valley of Nova Scotia, and the western part of Washington and British Columbia. The grape attains a similar importance in regions that are somewhat warmer and have drier summers. France, Italy, and central California are good examples, as are certain fairly cool regions where the frost-free season is prolonged by the presence of a body of water to windward, as on the southern and eastern shores of the more southerly Great Lakes. Coming farther southward to regions which are generally free from frost, but which nevertheless have a decided contrast between summer and winter, we find the orange as the great fruit in southern California, Florida, Spain, southern Italy, Palestine, and much of the lowlands of Australia. Finally in lands that are always warm and usually moist the banana probably forms a staple article of food for more people than does any other fruit.

One important fact in respect to vegetables is that their consumption per capita, and hence their importance as an article of diet, appears to increase with the density of population. Not only do some of them provide more food per acre than do cereals, but if eaten green they furnish more food per acre than if allowed to ripen, for two crops can often be raised where only one would otherwise be possible. The outcome of all this is that where low standards of living prevail and where warm summers with abundant rain cause vegetables to thrive, they are often raised in enormous quantities. In China and the neighboring regions, fresh vegetables seem to dominate the food shops a large part of the year. Their variety is almost incredible. King, for example, in *Farmers of Forty Centuries*, mentions 56 kinds of vegetables for sale on April 9th in an ordinary market in Shanghai. At the same time he saw only 6 kinds of animal food, counting both hen's eggs and duck's eggs. Such conditions account for the fact that in Table A the estimated value of garden vegetables surpasses that of any single product, including even rice. Such dependence betokens a dangerous economic condition; it means that people are living close to the margin of subsistence.

Legumes and Nitrogen.—Thus far we have been considering mainly the food products that provide carbohydrates, vitamines, and acids. Another great group is important because of its nitrogenous character. All the legumes carry an unusually high proportion of protein. Dried beans, for example, carry nearly 23 per cent of protein and peas nearly 25, whereas graham flour contains only 13 per cent and potatoes less than 2 per cent. Accordingly, these articles or allied species, such as the soy bean of Manchuria and the chick pea of India, assume great importance wherever other conditions such as low standards of living, density of population, religious prejudices, or unfavorable physical conditions cause the supply of meat to be limited. In India, for example, chick peas and other legumes, as nearly as can be judged from the imperfect statistics, occupy more space than wheat or millet and nearly half as much as rice. In China a similar condition prevails. In the United States the distribution of both peas and beans is very erratic. California in 1919 raised over 47 per cent of all the field beans of the United States; Michigan, another 31 per cent. Ordinary field beans need fairly cool, dry summers. Ordinary peas require a still cooler climate, so that Wisconsin and west-central New York are the American areas of greatest production. Cow peas and soy beans, on the other hand, require warm, moist summers. For that reason, the Carolinas, Georgia, Alabama, Mississippi, and Louisiana produce 80 per cent of the crop in the United States.

The Oil-producing Crops.—Another important group of crops furnishes fats or oils. These, like the crops that contain much protein, are important mainly in regions where animal food is scarce. Nevertheless, with the decrease of animal food per capita in the United States, and especially in Europe, the oil-producing crops are rapidly assuming great importance, even in the more advanced parts of the world. Peanuts, cotton seed, and the soy bean are the great oil producers in regions like the southeastern United States and southeastern Asia, characterized by long, warm, moist summers. Olives are the oil producers of the Mediterranean type of climate. Practically the whole of the world's supply still comes from the Mediterranean lands, although a few orchards have been started in California and Australia. Coconuts and the oil palm fulfill a similar function in moist tropical countries, and are fast assuming an important place in the world's commerce. Equatorial Africa is to-day the chief producer of palm oil.

Narcotics and Stimulants.—In addition to the great types of food plants which are really necessary for human health, the stimulants and narcotics must also be considered. Chief among these stand grapes. While grapes are of considerable importance as fruit, their importance as a source of wine is enormously greater. They are preeminently a European and especially a Mediterranean product. They do not mature unless the frost-free season lasts five or six months, and a longer season is desirable. On the other hand, practically none are raised in regions entirely free from frost. In the United States, the production of grapes in commercial quantities is almost limited to two types of areas: (1) two-thirds of the acreage is in California; (2) along the southeastern shore of Lake Michigan and the southern shore of Lake Erie there is a narrow belt where the grapes thrive admirably because the lakes cool the winds in spring and warm them in the fall, thus diminishing the danger from early blossoming and early frosts. In Europe, southern France far surpasses all the rest of the world as a grape producer, but Italy and Spain are also important. One reason why grapes are primarily a Mediterranean product is that they need moisture in the spring, and dry sunny weather in the summer and autumn.

Tobacco, quite unlike grapes, is distributed in a great variety of climates, ranging from cool southern Canada and northern Germany to warm regions like Java almost under the equator. Tobacco is so universally desired that farmers raise it in every country where it can be made to grow. Almost everywhere, however, its distribution is quite sporadic, for it is extremely sensitive and exacting in its soil requirements. A highly favorable combination of climate and soil is

found in the Ohio valley from West Virginia to Tennessee and in the lowlands of Virginia and North Carolina. The huge yield in these localities enables the United States to produce more than 38 per cent of the world's entire crop. Nevertheless, in 1919, tobacco occupied only 0.4 per cent of the cultivated area of the country, although it furnished 3.0 per cent of the total value. As transportation improves, the tobacco crop tends to become more and more concentrated in a few favorable areas. Thus in 1919 every state where tobacco supplied more than 5 per cent of the value of the crops showed a percentage greater than in 1909. In Connecticut, tobacco furnished 34 per cent in 1919 against 23 per cent in 1909, in Massachusetts 9 against 5,

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 93.—World Map of Tobacco.

North Carolina 18 against 11, Virginia 16 against 14, and Kentucky 34 against 31 (Fig. 93).

Tea and coffee likewise show a strong tendency toward concentration. Practically all of the world's tea comes from India (Ceylon), China, Java, Formosa, and Japan. China appears to be by far the greatest producer, for huge quantities are consumed locally. Coffee is still more concentrated. Although southern India, Java, and parts of Arabia and Africa near the southern end of the Red Sea produce a little, and there is some in the regions immediately around the Caribbean Sea, two-thirds of the crop comes from a small area in southern Brazil.

The Vegetable Raw Materials.—In view of the great number of food plants the number raised for raw materials is surprisingly small. Aside from forest products, which as yet can scarcely be called crops, the main vegetable raw materials are cotton, flax, linseed oil, rubber, and such rope-making fibers as hemp, manila, sisal, and jute, which is used mainly

for bagging. Of course many other vegetable raw materials are needed for minor purposes, such as straw goods, medicines, and dyes, but these cannot compare in value with the metals and other mineral raw materials.

Before the modern era of manufacturing and transportation, the clothing materials varied from region to region much more than now. In Europe, wool and linen (Fig. 94) predominated; in the Far East, silk; in India, cotton. In those days the labor of freeing the fiber from the seeds made cotton as expensive as any of the others. The invention of the cotton gin revolutionized the situation, and cotton became far the cheapest and in many ways the most serviceable of textile materials.

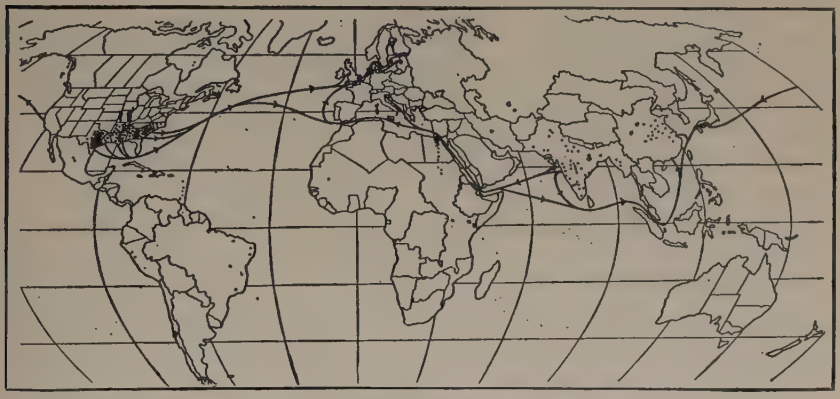
Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 94.—World Map of Flax Fiber.

Its cultivation was bound to increase rapidly. Three conditions determined where this increase should take place: (1) Cotton (Fig. 95) will not thrive unless the season free from frost is at least six months in length. Moreover, cotton is greatly injured by heavy rains and prolonged cloudiness, especially after the bolls are ripe and the white fiber is in danger of being discolored. (2) Cotton cannot be raised profitably without a large supply of cheap labor which can be called upon for a few months during the planting and especially the picking season. (3) Cotton culture can advance beyond the stage of a small and purely local industry only under the stimulus of people sufficiently intelligent and progressive to introduce ginneries and market the crop in far distant regions.

Aside from very dry areas like the Sahara and very moist areas like the Amazon Basin and central Africa, a large part of the region within 35° of the equator is climatically suitable for cotton. At the beginning

of the industrial era, however, cotton culture on a large scale was practically impossible in most of the vast area where the climate permitted it, for the inhabitants were mostly too backward to introduce ginneries and send their product to the distant lands where steam machinery was beginning to be used. Thus although India, China, Egypt, Mexico, and the Sudan had the right kind of climate and plenty of cheap labor, they failed to raise much cotton. Only in the southern states of America was the right combination available, for there a progressive type of white planters lived in a favorable climate and were surrounded by cheap colored labor. Thus the cotton-raising industry became intrenched on an enormous scale in the southeastern United



Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 95.—World Map of Cotton.

States. For a long time the rest of the civilized world was content to purchase its supplies from the Americans. The War of Secession made Europe realize how precarious is the condition when one country has a practical monopoly of a great product. Meanwhile, although Europeans were not settling in large numbers in most of the lands within 35° of the equator, enough became established there to start cotton plantations and ginneries and develop the cotton trade in India, Egypt, Mexico, Brazil and elsewhere. Thus for a generation or two the regions where the climate and labor supply are favorable have been attracting European capital and European managers so that there has been a tendency toward a more cosmopolitan distribution of cotton plantations (Fig. 95).

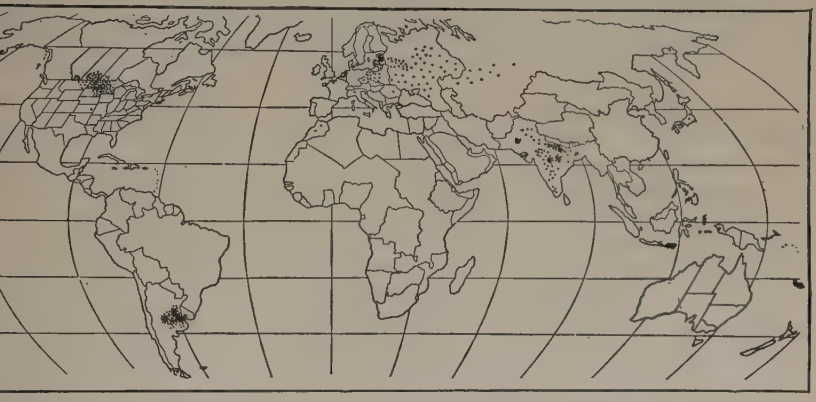
The history of rubber is much like that of cotton. Before the invention of the automobile, rubber was relatively unimportant, and wild supplies were almost sufficient. When rubber had to be raised as a crop,

the easiest place to raise it was the East Indies where the presence of the British and Dutch and an abundance of relatively industrious native labor supplied favorable human conditions, and a warm, moist climate supplied the essential physical requisites. So long as the demand for rubber was small, the production of the plantation product was concentrated in a limited area centering in the Straits Settlements. Then came the automobile, and the consequent great expansion in the rubber industry which increased the world's production sevenfold from 1905 to 1924, and at the same time lowered the price from $1.20 per pound to about 20 cents. Naturally the first tendency was to start many new plantations in the same general region where the old ones had been so prosperous. That worked well until a temporary oversupply and consequent fluctuations in price led to restriction of output in order to maintain prices. Then the United States, which consumes about 80 per cent of the world's supply, felt pinched and began to look about for new sources of supply. The situation of the United States to-day in respect to rubber is much like that of England after the American Civil War in respect to cotton; the greatest consumer is at the mercy of the greatest producer. But the greatest producer has the advantage of a long start, abundant experience, and a better type of labor than the United States is likely to find in most of the places where American influence is dominant and the climate is favorable. It will be interesting to see whether rubber repeats the experience of cotton and is some day cultivated, at least to a certain degree, in most of the countries which are climatically fit.

Rubber and cotton form an interesting contrast to the rope-making fibers and still more to most of the other tropical plantation products aside from sugar. The difference lies in the fact that cotton and rubber, like sugar, have become essentials of modern civilization. Therefore no great nation can afford to be at the mercy of any other nation or group of nations. The product, by its very nature, demands that its cultivation be so widespread that many different and perhaps opposed sources of supply are available. On the other hand, tea, coffee, cocoa, and many minor tropical products are not essential, for little real hardship would ensue if they ceased to be produced. There is nothing serious in the fact that Brazil raises two-thirds of the world's coffee, and Java over 95 per cent of the quinine. It is serious that Great Britain and Holland in one limited region control 90 per cent of the world's rubber, for it puts all other countries to a certain degree at their mercy.

The rope- and bag-making fibers, and also flaxseed (Fig. 96) from which linseed oil is made, fall in a group between the absolute essen-

als like cotton, sugar, and rubber, and the luxuries like coffee and nocolate. Rope, twine, and bagging are indeed essentials of civiliza-on, but the hemp of northern Europe can take the place of the manila f the East Indies or the sisal of Yucatan; flax can be used for rope if ecessary; and cotton or flax can take the place of jute. For this eason and because the total demand for the rope-making fibers is elatively small, the world has thus far been almost content to permit ach fiber to be cultivated mainly near its immediate point of original ultivation. Here as in many other cases, we see an example of one of he great principles which dominate the distribution of the world's great roducts. At first a product is raised merely in its natural habitat.



noyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 96.—World Map of Flax Seed.

hen it tends to be concentrated in limited regions where climate, soil, nd relief, and conditions of labor, supervision, transportation and arkets make it most profitable. There it remains indefinitely if the emand is relatively small, or if it is an article in which a shortage does tle harm. If, however, it is a product of really great importance, the ndency is to carry it to all parts of the world where it can be made to ow with reasonable success and profit. That is what has happened the cereals, but far less to millet than to the more valuable types such rice, corn, and wheat. It has happened likewise to potatoes, cotton, nanas, beans, and some of the other products in Table A, and appears be on the point of happening to rubber. In the case of silk, the ocess of expansion has actually given place to contraction, partly cause the cost of transportation is almost negligible. What has hap-ned to silk might possibly happen also to other products if universal ee trade should prevail, if fear of wars should disappear, and if there

were no such thing as artificial restriction of output in order to raise prices. Under such conditions each product would be concentrated in the areas where physical conditions, the labor supply, and the cost of transportation allow it to be produced most economically. It would expand beyond those areas only as the demand became great enough to overcome the greater cost of production due to less favorable surroundings.

EXERCISES AND PROBLEMS

1. Study the distribution of the world's chief crops. Let each member of the class make three world maps based on columns A, B, and C for one of the products of Table 12. Shade all countries where the yield exceeds the following figures; but *do not shade* the parts of the larger countries where your special product does not grow.

A. Yield per 1000 people: potatoes, 10,000; wheat, oats, barley, corn, rye, tobacco, flax fiber, cotton (per 1,000,000 people), 5,000; flaxseed and sugar, 100; rice, 100,000.

B. Yield per acre: potatoes, 150; wheat, corn and rye, 20; oats, 30; barley, 25; tobacco, 500; rice, 1000.

C. Yield per square mile: potatoes, wheat, oats, and cotton, 1000; barley, corn, rye, tobacco, flax fiber, 500; rice, 10,000; sugar, 15. Note that China and certain minor countries are omitted in most cases for lack of data.

Compare your three maps. What countries, if any, are shaded on all three. What does that indicate as to (*a*) climatic optima, (*b*) relief, (*c*) density of population, (*d*) type of agriculture? Which of your maps indicates a surplus of your product? How? Why is no surplus of wheat indicated in Russia which is well known as an exporter of that product? Find similar cases for other products. Now compare the maps for all products, grouping the maps according to the classification in the first table of this chapter. What general regions show the greatest degree of shading for each type of map (A, B, C) in the case of cereals, other vegetable foods, animal feed, and raw materials? Explain the reasons for this.

2. Amplify Exercise 1 by another method. Let each student make a bar diagram of one product in Table 11 on the model of Fig. 49. On the left make bars showing the production of your product, arranging the countries in the order of production. On the right make bars indicating the population according to Table 1. Include all countries having a population of at least 10,000,000, even if they do not produce your product. What conclusions do you draw as to the relation between crop production and population?

Bring together the diagrams for all products. Which crops are most widely produced? In which is there the closest correlation between number of people and crop production? What countries most consistently show about the same relation between population and crop production?

3. Vary Exercise 2 by placing on the right-hand side the data from columns A, B, or C in Table 12. Also put data of column A, B, or C on one side of a bar diagram like Fig. 49 and data from one of the other columns on the other side. Draw conclusions as to the inter-relations of total yield of a crop, yield per capita, yield per acre, and yield per square mile.

4. Repeat Exercises 1 to 3, but use the states and provinces of the United States nd Canada as given in Tables 15 and 16.

5. Study the climatic relationships of some crop. From Fig. 133 prepare a able showing the approximate length of the growing season in the main agricultural rea of each state. Arrange the states in order according to the length of the growing eason. Use this as the basis of one side of a bar diagram like Fig. 49. On the other ide make bars showing the yield per acre of one of the crops in Table 16. What elationships do you see? How are these modified by rainfall?

6. Use Table 42 for a study of the part played by the main crop in the foreign ommerce of the United States. List all the crops mentioned in Table 11. Under ach crop enter separately the names of countries where the United States either ells or buys much of the product, together with the value of the sales or purchases. Discuss the following: (*a*) relative value of crops as imports and exports, (*b*) part played by crops compared with other products in foreign trade, (*c*) kinds of crops most important as exports and imports, (*d*) cultural and climatic conditions of countries where crops are bought or sold by the United States in large quantities.

CHAPTER XVII

FARMERS OF THE TEMPERATE ZONE

Types of Communities Depending on Plants.—Far more than half the world's inhabitants get their living directly from plants. The lumbermen merely cut the trees that have grown without human care. The primitive tropical farmer sets out a few palm or banana trees, or drops some seeds of pumpkin, yam, or cassava into a hole punched with a stick, and leaves the plants to care for themselves with perhaps a single careless hoeing. His more advanced tropical and subtropical neighbors carry on an ancient and painstaking system of irrigation and transplantation in the culture of rice, or else under the guidance of people from cooler climates, cultivate plantations where a single crop, such as cacao, tea, or sugar, is raised for distant markets. Outside the tropics many of the farmers likewise devote themselves almost exclusively to a single crop raised by the so-called "extensive" method of cultivating a large area somewhat carelessly with the aid of animals or machinery. Another large group are horticulturists or gardeners who raise a variety of vegetables, grains, or fruits, and who cultivate their land intensively without much use of animals. Finally the highest type of farmer cultivates a variety of crops somewhat intensively, and systematically makes the raising and use of animals a part of his farming. Thus we have at least seven types of communities that depend on plants, namely (1) lumbermen, (2) primitive tropical farmers, (3) ordinary tropical or subtropical farmers, (4) tropical planters, (5) one-crop farmers of non-tropical regions, (6) horticulturists or gardeners, and (7) all-round farmers. Primitive tropical farmers, though extremely interesting, contribute so little to the world's business that they will not be discussed further. Of the other six types the three from non-tropical regions will be discussed in this chapter, while the two tropical types and lumberers will be left for later chapters.

The Nature of One-crop Agriculture.—The one-crop farmer, as the name suggests, relies largely on a single crop, even though he may plant more or less of several others. He generally cultivates this crop by extensive methods; that is, he scatters the seeds over an area too large to permit close attention to the growing crop. Thus the size of

his crop is peculiarly dependent upon the weather, and its failure often ruins him. There are many examples of this type of farmer—the cotton farmers of the southeastern United States, the tobacco farmers of Kentucky and Virginia, the wheat farmers of the Dakotas, southern Russia, and Asia Minor, the rye farmers of central and northern Russia, and the currant farmers of Greece.

Such dependence on a single crop is often, although not always, due to one or both of two main reasons: (1) the crop is supposed to be the most profitable that can be grown in the region in question. This is the case with many of the American one-crop farmers. (2) The people are too inefficient to attempt a variety of crops because they are deficient in physical vigor, low in mentality, poor in education, or discouraged by social and political conditions. This is common in old countries like Turkey.

One-crop agriculture is subject to at least two great disadvantages. First, crop failures are particularly disastrous, for the farmer has no large second crop to fall back upon. Second, one-crop agriculture has a peculiarly bad effect on the fertility of the soil, for the crop takes away the same plant foods year after year. As few animals are kept, there is little manure to restore fertility; and periods of rest when the fields lie fallow add no new plant foods, although they allow the materials already in the soil to become still further weathered and prepared for the plants. Even if fertilizers are imported, the soil of one-crop farms cannot be kept as fertile as that of farms where a wiser system is practiced.

The Business System in One-crop Regions.—In regions where the geographical conditions help to cause one-crop farming to persist for a long time, the whole fabric of business is affected. In the first place, the one-crop farmer, like the raisers of animals for meat and wool, makes relatively few demands upon the outside world. He buys, to be sure, a considerable portion of his food. For instance, the southern cotton grower may actually bring corn from Illinois and Iowa although his own climate and soil are adapted to that product. He also buys some implements, fertilizer, clothing, and other manufactured goods, but as he is often poor because of the exhaustion of the soil and the repeated failure of his one crop, his demands are not large. Moreover, the sale of his one product requires only a few transactions each year. Hence, although the one-crop farmer with his cotton, wheat, barley, rye, or tobacco, as the climate and soil may dictate, unquestionably plays a great part in the world's production, he himself in many cases receives little stimulus and profit thereby.

In practically every country where the one-crop system has been

long established, two unfavorable practices—crop liens and tenancy—have become deeply rooted. This is true in the cotton-raising South, in Turkey, Russia, India, Spain, especially Andalusia, and elsewhere. The secret of it lies largely in the fact that where one crop is the main reliance, a single bad year may throw the whole community into poverty. Often when seedtime arrives the farmers have no seed, no fertilizer, and no money. This provides a wonderful opportunity for the money-lender. Land is commonly cheap and not easily salable because it has been overcropped. Therefore the money-lender prefers a lien on the prospective crop rather than a mortgage on the farmer's land. Time after time the crop is less than the farmer expects, and his debt remains largely unpaid, while ruinous rates of interest continue. Where the farmers are dull, inert, or happy-go-lucky as in many Asiatic regions, in Russia, and among the colored people of the United States, this means almost permanent indebtedness which is not far removed from peonage.

The system of liens leads to tenancy. Since the farmers are not stimulated and trained by business dealings or otherwise, they do not know how to protect themselves. Hence, many farms fall into the hands of money-lenders or of large proprietors, and the former owners become tenants who work the farms on shares. In parts of the southern United States many of the whites and four-fifths of the colored people are share-tenants. The system is extremely bad, for the tenant has no incentive to improve the land. What does he care if the farm of a hard landlord deteriorates? The tenant's side of the bargain is seldom favorable, as may be judged from the following rhyme sung by the colored tenant who finds that when his cotton crop is baled and divided between the owner of the land and any others to whom he is indebted, it is a case of

> "Naught's a naught, and figger's a figger.
> All for the white man, and none for the nigger."

Fig. 20 (page 55) showing the percentage of farms operated by owners gives an idea of the contrast between the North and South in respect to farm tenancy. Of course tenancy may be a step in the right direction if it means that a young man is temporarily a tenant while buying a farm, but when tenant farmers simply pay rent generation after generation, and even fall into debt because of the failure of their one crop, it is extremely harmful. See also Figs. 22, 26, and 27.

The One-crop Cotton Farming of the South.—Let us take cotton and wheat farmers as examples of the business conditions in communities of the one-crop type. In the southern United States tobacco was originally the most profitable crop, but the invention of the cotton gin,

spinning jenny, and many other machines for cotton weaving, gave cotton an unrivaled lead more than a century ago. The general growth of manufacturing in England, New England, and elsewhere produced an enormous demand for raw cotton, which only the South could supply. The long, warm summers with their abundant rain furnished the right kind of climate. The Negroes supplied abundant and cheap labor for planting and especially for the prolonged work of harvesting; and highly intelligent white planters supplied the organizing ability for running big farms and for marketing the crop.

At first there was plenty of fresh land with fine rich soil, which yielded abundant and profitable crops even with wasteful slave labor. When the yield began to diminish seriously because of exhaustion of the soil, new land was broken on another part of the plantation, and the planters still prospered. Finally, however, the old fields had to be cultivated once more, but careless habits were so firmly established that the fields rarely received the requisite fertilizers or intensive cultivation with modern implements. When any cause lowered the price of cotton, the farmers at once felt the results of their mistaken policy. For example, during the Civil War when cotton was almost unsalable because it could neither be exported to Europe nor sold to the mills in the North, the cotton planters almost starved. Early in the Great War, when cotton dropped from 12.2 cents a pound in 1913 to only 6.6 in 1914, the condition of the cotton growers was so bad that everyone was urged to " buy a bale " and hold it in order to help the South. A little later, in 1920, the price soared to 37.7 cents a pound and the Southern farmers prospered exceedingly. But after the war the price fell again to 11.5 cents in 1921, and there was renewed distress. The net result is that during periods of economic disturbance the South, because of its one-crop agriculture, may suffer more than almost any other part of the country.

Elimination of the One-crop System in the South.—In the southern United States a vigorous campaign is being waged against the one-crop system. The boll weevil is an ill wind that has blown some good, for it has helped to convince the Southerners of the evils of the one-crop system. Its ravages discouraged cotton raising so much that in desperation some planters have turned to raising cattle. Their profits have encouraged others to follow suit. Again the boys' corn and pig clubs initiated by the Government have done much good, for the boys often set their fathers an example in improved methods. Equally important are the teachings of the industrial schools and experiment stations. At present most farmers buy their seed direct from the ginning factory, taking it as it comes, some good, some bad.

The schools are teaching them to buy or raise selected seed which will yield cotton with fine, long, abundant staple, and seeds of large size with much oil. The item of oil alone is highly important, for to-day the cottonseed oil of the South is worth about 100 million dollars per year. Another lesson is that of cultivating the soil as well as the cotton. For example, a man who was born as a slave bought some worn-out land which a white planter had "turned out." By the use of green manure and good tillage he obtained three and a half bales of cotton per acre whereas the average yield for the whole South is only about one-third of a bale, or one-tenth as much. With similar care everywhere the South could raise all the cotton that the world will take and also have abundant crops of many other kinds to preserve the fertility of the soil, give the farmers a more varied and stimulating occupation, and encourage them to use their ingenuity. The South, like all other places that are afflicted with the one-crop system and with the crop liens, tenancy, and discouragement which go with it, needs the system of Government loans which is gradually being adopted; it needs better transportation and better systems of marketing the crops; but above all it needs to arouse itself so that each farmer will raise a well-planned variety of crops which will keep him busy at all seasons and stimulate him to do his best.

The One-crop Culture of Wheat.—Although vast quantities of wheat are raised by all-round farmers, as in France and Illinois, there are few crops in which the one-crop system is more widely prevalent. In the United States and Canada this type of agriculture is a temporary phase because the people are intelligent enough to see that though it is highly profitable on virgin land, it does not pay permanently. The same will also probably be the case in Australia and Argentina, where wheat is practically the only crop in vast areas. In more backward regions such as Algeria, southern Italy, southern Russia, northern India, and much of western Asia, the one-crop, extensive system of wheat raising has become almost permanent. This is partly because of scarcity of rain at some seasons, especially in summer, and also because of frequent droughts. These conditions prevent the growth of many crops and keep the people poor. Moreover, many of the one-crop farmers lack energy and initiative.

In the United States, Canada, and Argentina the one-crop system of wheat raising has been steadily pushed westward. Formerly the knowledge that there was plenty of new land made the American wheat farmer careless of how he exhausted the soil, just as the Russian farmer was made careless by the knowledge that, owing to his communal system of holding lands, the tract that he cultivated might next year

be assigned to someone else and he would reap no benefit from improvements. So the frontier wheat farmer scattered the seed over scores of acres and left it to the care of nature—the most extensive of all kinds of farming. Even now this system still persists somewhat in the Dakotas, Washington, and Alberta. For example, in 1919 Adams and Franklin counties in southeastern Washington actually planted wheat in 98 per cent of their cereal area, that is, in about 88 per cent of all their cultivated land including the part devoted to hay. But wheat exhausts the soil about twice as rapidly as cotton, and the growth of population makes the land more valuable for other types of farming. Hence, the one-crop wheat system rarely endures permanently among progressive people.

The one-crop frontier wheat farming of the United States and Canada has encouraged some unique developments in machinery. Such huge farms with a single short period of sowing and again of harvesting are confronted by a very serious labor problem, especially as they are located in regions of sparse settlement. At harvest time the farmers must depend largely on itinerant labor attracted from regions farther east by high wages. Men temporarily out of work in the villages and cities, college students, and sons of the Corn Belt farmers who have completed the summer work on their own farms travel to the wheat fields when the grain is ripe. Nevertheless, there is often a serious shortage of labor, and the wheat farmer is rarely sure of getting all the men he needs. This has led to the invention of improved machinery such as gang plows, huge reapers, and twine binders. Thus the amount of human labor needed in raising one bushel of wheat has been reduced from three hours in 1830 to ten minutes today. In spite of this, the need for labor is still great, as may be judged from the fact that in 1921, when many men were idle in the East, the western farmers of the United States and Canada were clamoring for help. The United States Department of Labor carried fifty or sixty thousand men to the grain fields, but they were not nearly enough.

To-day one-fifth of the wheat in the United States is raised on small farms of less than one hundred acres. On such farms the great machines are too expensive unless the farmers learn the lesson of the dairymen and cooperate in owning them. As the big one-crop farms give place to all-round, diversified farming, commercial fertilizers are introduced, crops are rotated, leguminous crops like clover are planted every few years and plowed under to provide nitrogen, and the number of stalks to each plant is increased by tillering or partly covering the young plants with soil. The Government cooperates with the farmers in fighting the Hessian fly, and in finding varieties of wheat adapted to all sorts

of climate and soil, as the Durum variety is adapted to semi-arid regions. In all these ways the wheat farmer is changing his methods so that not only is the yield of wheat per acre increasing, but wheat becomes merely the cash crop, while the farmer's food supply comes from other crops.

In backward countries where the one-crop system has become firmly established, it leads to many difficulties and much hardship. For instance, in southern Russia many famines, including those of 1891, 1898, and 1921, have been due to deficient rains at critical periods and consequent failure of the wheat crop. If other crops could be raised, whose critical periods came at different times, the chances of famine would be much diminished and the prosperity and civilization of the affected regions would be raised. Unfortunately for such countries as Algeria, Turkey, and northern India, the rains come only at limited seasons, a fact which makes it hard to find many crops that will thrive and thus tends greatly to establish the one-crop system of agriculture.

The Horticultural Community.—*The Use of Vegetables and Fruit.*—The use of fruit and vegetables, especially the latter, is steadily growing for both economic and physiologic reasons. The economic reason applies especially to countries like China and Japan where the population is so dense that it is necessary to utilize the land to the fullest extent, but it also applies to the growing population of the manufacturing regions of the United States and Europe. As the population becomes denser and as the proportion who dwell in cities increases, the prices of grain and meat rise rapidly. The acreage actually farmed becomes too small to support the entire population unless more intensive methods are employed. Vegetables, as we have seen, are especially adapted to intensive cultivation because they yield a large amount of food per acre and grow so rapidly that two crops can often be raised in one season. Improvements in methods of canning, preserving, and drying, and better facilities for transportation and cold storage also help by making it possible to utilize vegetables more widely and at all seasons.

The physiologic reason for using fruits and vegetables depends on the recent discovery that they contain substances called vitamines which are essential to health. The economic demand of poor people for vegetables because they are cheap and the physiologic demand of intelligent people for both fruits and vegetables at all seasons because they are healthful has greatly stimulated the growth of communities whose business is to furnish fruit and garden produce to city markets. Such farming is called market gardening when carried on close to the cities, and truck farming when carried on farther away and hence less intensively. Market gardeners, truck farmers, and fruit growers, as well as the people who raise flowers, are known as horticulturists.

The Geographic and Economic Control of Horticulture.—Before the development of modern transportation, each region was content to eat those fruits and vegetables which the climate permitted. In the more progressive regions a few people had greenhouses and many gardeners used cold frames to start their early vegetables. To-day this is greatly changed, for transporation allows keen competition between widely separated areas. For example, in supplying the northern cities with the lettuce and spinach which now appear on many tables almost daily even in winter, truck farms all the way from Florida northward as well as those of California, compete with local market gardeners who raise their product under glass. Such competition leads the gardeners to specialize in what are called " cash crops " especially adapted to their particular regions. The crops that are specialties in a given community are determined largely by the following considerations.

(1) Other things being equal, the producer near the market has a great advantage, not only because of lower freight and express charges but because his product is relatively fresh and his losses from decay and waste are relatively slight. Part of many a shipment to New York from the South is thrown away. (2) Soil is also a factor of some importance. A sandy loam is favorable because it warms quickly and facilitates early crops, and is also easily, cleanly, and cheaply worked. (3) The most important factor is climate, which determines not only the season at which crops can be raised but how many crops per year. The South Atlantic States and California have the advantage of a long growing season. They often harvest two crops for sale and raise a third for fertilizer. On the other hand, the warmer states, especially in the East, have more trouble than the cooler states with insect pests, their soil is more leached by the rain so that more fertilizers are needed, and their labor supply, being largely colored, is less energetic and intelligent.

The progressive truck farmer wishes his locality to possess three other advantages: namely, plenty of clear water for irrigation or for preparing vegetables for market, a good air drainage so that cold damp air will not settle over the crops in spring, and good roads so that trucks may quickly reach the shipping points. Horticulture also requires a dense population because it demands a great deal of cheap seasonal labor. The plowing and planting, the cultivating by horse or machine, and the heavier harvesting as well as the work of taking the vegetables to market or peddling them from house to house generally require men, but the careful hand weeding, the picking of small fruits, peas, beans, and so forth, and many other little jobs need the work of hundreds of women,

girls, and children. The supply of labor must be not only cheap but of a sort which may be recruited quickly for the short harvesting season. When fruits and vegetables are ripe, they must be picked immediately. In fact, some peach growers consider that there is exactly one day on which that fruit should be picked. It is almost impossible to find cheap labor which is willing to work for a short time unless there are industries near by which employ the men of the families, but not the women and children. For that reason the market gardeners, who form a ring around practically all great cities, are able to engage in much more intensive cultivation than are the truck farmers who are farther from the labor supply. It must be remembered that intensive cultivation, like that which is so dominant in China and Japan, requires an immense amount of hand labor, but yields a large return from a small area; extensive cultivation, on the contrary, employs a relatively small amount of human labor for it relies on horses or machines; it raises much per individual, but not so much as the intensive method per acre. The intensive method is essential when the population is dense, but it always means that somewhere in the vicinity there is a considerable body of relatively poor people who furnish a cheap labor supply. The extensive method implies a much higher general level of comfort although it does not usually imply the existence of the small group of rich people who are generally the accompaniment of the poor people with their cheap labor. (See Fig. 2.)

Cooperation among Horticulturists.—The fact that horticulturists generally live in fairly compact communities makes cooperation relatively easy. In irrigated regions this is peculiarly the case, for the whole community depends on a common water supply, and each man's rights must be carefully guarded so that he may get neither too much nor too little water. Among market gardeners and truck farmers, however, there is much less cooperation than among dairymen, but more than among wheat and cotton farmers. The fruit growers have made most progress in this respect. For instance, in California one cooperative society has 8000 members. Such societies arose largely because of the difficulty of shipping fruit long distances without great loss. The fruit raisers require low railroad rates, refrigerator cars, and fruit expresses. Their fruit needs to be cooled before shipping; their common enemy, the many fruit pests, has to be fought. So to-day the Western fruit growers' associations are well-managed business enterprises directed by experts who conduct advertising campaigns, protect their brands of fruit by copyright, enforce careful grading and packing, care for the pre-cooling of the fruit and the icing of the cars en route, negotiate for lower freight rates, keep in telegraphic communication with the Eastern

markets so as to hold back or change the destination of shipments, and purchase tools and other supplies for their members at wholesale prices.

Possibilities of Horticulture.—The possibilities of horticulture are enormous, and the people of the United States have much to learn in this respect from China. In the United States most of the land has been cultivated less than a hundred years, and many soils are already exhausted. The annual bill for commercial fertilizers amounts to 300 million dollars. In China the soil has been cultivated thirty or forty times as long and is still highly fruitful, for the farmers have preserved the fertility of the soil even without importing fertilizers. In the United States the number of improved acres per person is about 5; in China less than 2. Here is an actual example of what a farmer in China can do by means of intensive horticulture. On an acre and two-thirds he supported ten people, one donkey and one pig. At the same rate one square mile of land would support 3840 people, 384 donkeys, and 384 pigs. This represents a standard of living far lower than is desirable, but it illustrates how great are the unused possibilities of the land. The most desirable thing is that each acre of land should yield the largest possible return in proportion to the work and capital put into it. In China too much work goes into each acre; in America the opposite is probably the case.

Diversified All-round Farming.—*The Well-rounded Work of Diversified Farming.*—The highest type of agriculture is a combination of all the other types. If farming is to be as scientific an industry as engineering for example, which it surely must be in the future, the farmer must solve some very complex problems. He must determine what types of crops will be most profitable on the basis of (1) the climate, soil, and topography; (2) transportation facilities and distance to market; (3) type of produce most in demand; (4) relation of his business to that of his neighbors; (5) cost of his land, his supply of capital, and the cost of labor; (6) prevalence of harmful insects and other pests; and (7) the customs of the community. Where so many factors are involved it is clear that some will be favorable to one crop and some to another; and also that some may vary considerably from year to year. Hence, the farmer's best solution of his problem is to distribute his capital so as to take advantage of the greatest number of desirable combinations. Thus he becomes an all-round farmer interested in grain raising, truck farming, dairying, and meat raising. In this way he uses his labor supply economically since he chooses crops that can be planted and cared for at different periods during the growing season. By raising animals, especially dairy cows and poultry, he provides as much

work as possible through the winter so that he can keep some of his farm hands through the year and can also have a cash income every month. Furthermore, by keeping animals he retains the fertility of his farm, for he restores to the soil most of what is taken out. Moreover, he saves much waste by feeding the animals the stubble, garbage, skimmed milk, and the fruit and vegetables which begin to rot even on the best-managed farms. (Compare Fig. 86.)

As one rides through a region of such farms in Ohio, Illinois, or Iowa, for example, he sees that the best of them have substantial, comfortable, well-cared-for farm houses. Each house is flanked not only by a large barn for cattle, horses, and hay, but by a silo, some poultry houses, a hog barn, and several smaller buildings such as a tool house, garage, and woodshed. On one side of the buildings a good-sized orchard produces chiefly apples, but also other fruits. On another side there is a vegetable garden, while probably a pretty flower garden adorns the front. Not far away a pasture of perhaps an acre or two provides a place where the animals can be turned out. Farther away there are large fields of corn, wheat, barley, hay, and alfalfa, and smaller fields of potatoes, cabbages, sugar beets, and so forth. Some land is devoted to pasturage and perhaps to a woodlot. No one farm is likely to raise more than about half a dozen crops at any one time, and the exact combination varies from farm to farm and region to region. The point, however, is that the crops include grain, vegetables, fodder, and fruit.

Geographical Limitation of Diversified Farming.—Such all-round farms are limited to a relatively small part of the earth's surface. They are found in large numbers only in the northern, and especially the north central part of the United States, where part of Illinois is an example; in southern Canada; in New Zealand and a small part of southeastern Australia; and in northwestern Europe where northern France is an excellent example. Elsewhere an occasional farmer has such a farm, but they are the exception. The reason why this highest type of farming is much less widespread than either the one-crop type or horticulture is that its requirements are much more exacting. In the first place it requires a fair supply of rain at all seasons or else irrigation. Otherwise the crops that can be grown are limited in variety, and dairy cattle are hard to keep in good condition. Second, it demands a fairly good development of transportation, for otherwise the farmer cannot market his milk, butter, and eggs, and his crops that need to be used soon after gathering. Again, diversified farming requires a greater knowledge than almost any other kind of farming, for the farmer must not only have a knowledge of crops and soils, but of animals. More-

over, it requires more energy and greater mental activity than most kinds of farming, for the successful all-round farmer must always be on the alert, and must be a good business man as well as an agriculturist.

Just so far as the farmer lacks these qualities he tends to degenerate toward the one-crop type. In fact many men who would say that they are practicing diversified farming are in reality only in a transition stage between that and the one-crop variety. To-day many market gardeners, fruit farmers, and dairymen are more highly trained and competent than the ordinary all-round farmer. They are often specialists while he is a general worker. This, however, does not necessarily mean that the specialized type of farming is the best. It probably means that large combinations are needed in farming as in many other occupations. The ideal farm should perhaps have a section devoted to dairying in charge of one specialist, a section devoted to truck farming in charge of another, and similar sections devoted to fruit, poultry, grain, or other products. The main point is that the most successful farming requires (1) that the fertility of the soil be preserved by raising animals and by every other possible means, and (2) that the risks be distributed so that there will be no danger of disaster because of the failure of one or two crops. Such farming requires specialists. It also requires that the men who run the different parts of the farm have a direct personal interest in its success. Therefore it requires specialization and cooperation as well as conservation and diversification.

EXERCISES AND PROBLEMS

1. Choose a foreign country or region where one of the main types of the agriculture of the temperate zone is well developed. Look this up in the encyclopedia and other reference books, and write an account of its agriculture along the lines indicated in this chapter.

2. Study the agriculture of regions of the United States where one crop predominates over all others. The Census of 1920 contains a table (p. 717 in Vol. V) showing the per cent of the total value of crops represented by various individual crops. Make a list of all states where at least 40 per cent of the total value of all crops belongs to any one crop, beginning with corn. Group these states according to the main crop. On an outline map shade in separate colors the states where each of three main crops tends to be the chief reliance of the farmers. Explain the reasons for the distribution of these states. For each of the three groups tabulate the figures from the following tables: 10 D, I, K, and M; 19, all columns. Draw conclusions as to prosperity, tenancy, race of farmers, and abundance of animals where each of the three crops predominates. It may help if you obtain averages for each group, or if you use a few typical farming states, namely Iowa and Nebraska as corn states, Mississippi and Arkansas as cotton states, and Wyoming and Nevada as hay states. What difference does the number of animals make in

determining whether a state really practices one-crop farming in a harmful form? Describe the corn, cotton, and hay types of agriculture in relation to the types described in the text of this chapter and the last.

3. The table in the Abstract of the Census referred to in Exercise 2 suggests that Pennsylvania perhaps comes as near as any state to having an ideal combination of crops. See if you can determine why. What other states have nearly as good a combination? In what respects are the following states less favored or more favored than Pennsylvania: Massachusetts, Illinois, South Dakota, North Carolina, Alabama, Oklahoma, Utah, Oregon, California, Florida, your own state?

4. Compare the use of the arable land (Table 9) in regions with the following climates: (*A*) cyclonic temperate with rain at all seasons (use Austria, Canada, France, Germany, Great Britain, New Zealand, and United States), (*B*) Mediterranean, with winter rain and summer drought (use Algeria, Australia, Chile, Italy, South Africa, Spain, and Tunis), and (*C*) tropical (use Costa Rica, Cuba, Dutch East Indies, Formosa, French Indo-China, India, and Porto Rico). Make a table showing the average for the countries of each climatic group according to each column of Table 9. Discuss the nature and causes of the differences in the averages. In which group does the apportionment of the arable land come nearest to the following: cereals, 50 per cent; hay and forage, 20; food plants and vegetables, 15; industrial plants such as cotton, flax, and hops, 10 (the remaining 5 per cent fallow land used as pasture)? Explain why this apportionment of the land is favorable or unfavorable. Pick out countries where the apportionment is nearly as above. How do they rank in progressiveness?

CHAPTER XVIII

THE MAIN BUSINESS OF TROPICAL COUNTRIES

Conditions that Control Tropical Agriculture.—In tropical countries the products of agriculture are overwhelmingly the main contribution to the world's business, although lumber may soon be exported abundantly. Other forest products have some importance, but wild rubber, ivory, cabinet woods, medicinal barks, gums, etc., play a very small part compared with the sugar, coffee, tea, rubber, cacao, quinine, and fruit raised on plantations. Tropical agriculture, as we have seen, falls into three main types: (*a*) Primitive hoe culture, which contributes almost nothing to the general business of the world; (*b*) Ordinary tropical agriculture based largely on rice, but often on corn or millet. This resembles the one-crop agriculture of cooler regions but has far less effect in providing products for sale to other communities. (*c*) Plantation culture, which is of great and growing importance. Before discussing the last two types, let us consider the general geographical factors which control not only the agriculture of the tropics, but the relation of the white man to warm climates.

(1) *Rapid Growth of Vegetation.*—One of the most notable features of tropical countries is the luxuriance of vegetation. For instance, in order to visit some of the wonderful Maya ruins a traveler wanted to traverse certain roads shown on the best maps of Yucatan. "But there are no roads," said the guide. "They are on the map, but that was made five or ten years ago when the chicle gatherers were bringing out gum. No one can find them now. They have all grown up to forest."

In such regions ordinary bushes grow 6 feet a year, while types like the banana shoot up 15 or 20 feet. In the clearings the weeds seem almost to spring full grown from the ground. Certain grasses make a dense mat that chokes everything else and can be rooted out only at an almost prohibitive expense. Many tropical farmers have to clear new lands each year because of the grass and weeds. For example, in the Philippines about 48,000 square miles, or 40 per cent of the whole area, are covered with tough cogon grass 5 or 6 feet in height and with the tahalib grass of the moister parts which reaches a height of 9 or 10

feet. Such rapid growth has certain advantages as well as disadvantages. Sugar cane is fit for cutting in a year after planting; huge bunches of bananas are ripe, not much more than a year after the buds sprout from the root; rice yields 10 to 100 bushels per acre compared with 10 to 30 for wheat in the temperature zone; and two or three crops of millet can be grown each year.

(2) *Low Food Value of Tropical Products.*—The rapid growth of tropical products tends to give them a low food value. Rice, which is far the best of the common tropical foods, is less nutritious than any of the other important cereals except rye and millet, but millet is also largely a tropical product, often rivaling rice in importance. Although rice supplies nearly as many calories of energy per pound as wheat, it contains about 2.5 times as much starch as there ought to be in an ideal food in order to balance the proteid or muscle-building material, while in corn the proportion is only 2.1, in wheat 1.4, and in oats 1.1, or almost exactly right (Fig. 97). The banana fills people's stomaches but it does not supply strength, even though recent studies show that it furnishes vitamines. It would take about 10 pounds of bananas per day to yield the energy or heat needed by a man at hard labor, and 50 pounds to yield the necessary proteid. The tropical vegetables are generally coarse, stringy, and watery. The sweet potato, for example, contains proportionally only half as much protein as the common white potato, and the yam and cassava are still more starchy. The coarse, bulky, starchy, tropical diet causes many digestive disorders and other diseases. Beans and various kinds of pulse are indeed raised to supply protein, but not in sufficient quantities. Many tropical people have such a craving for meat that when they wish to honor a stranger they give him so much meat that he craves vegetables and fruit. Another cause of ill health is the monotony of the tropical diet. If people have rice, they often eat rice and almost nothing else; if they have millet or cassava, they eat millet or cassava. Likewise, although some cultivated forage plants such as Para and Guinea grass and Sudan grass make good fodder, most of the plants eaten by animals, though often large and succulent, are relatively lacking in nutrition.

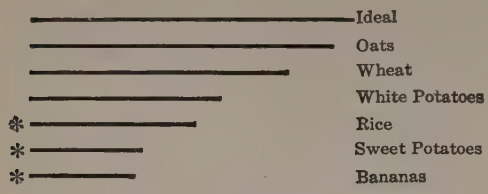


FIG. 97.—Relative Amounts of Proteids Compared with Fats and Carbohydrates in a Given Dry Weight of Tropical or Subtropical Foods Versus Those of Cooler Regions. (*) Tropical or Subtropical.

(3) *Rapid Exhaustion of the Soil.*—We have already seen that the abundant rain and high temperature of tropical regions allow the soil to be rapidly weathered and leached. This intensifies the effect of the climate in causing tropical food products to be poor not only in nitrogenous proteids, but in potash and phosphates. A minor result of the rapid leaching of the soil is that in the moister regions it probably intensifies the effect of weeds, grasses, and toxic infections of the soil in preventing the primitive tropical people from raising more than one or two crops from a field without allowing it to rest several years. Thus in Yucatan among the Maya Indians and in northern Burma and Siam among the Shans, it is common to cultivate a field one or two years, then make a new clearing, burn the brush, and start a new field. Such practices prevent the accumulation of capital in the form of improvements on the land and permanent houses.

(4) *Scanty Supply and Poor Quality of Animals.*—Most people think of tropical regions as the home of many animals. There live the dangerous carnivora such as the lion and tiger, and a host of herbivora such as the elephant, hippopotamus, gnu, and many antelopes. Nevertheless, domestic animals, as we have already seen, are scarce and of poor quality. Not only are the more valuable types forced to live under conditions quite different from their optima, so that they cannot resist disease, but many of the forage plants are either tough and coarse or so succulent that they afford little nutrition. Even the best types of tropical forage plants, such as Para and Guinea grass and Sudan grass, are not equal to the best types of cooler regions. Moreover, innumerable insect pests annoy the animals terribly. Hence, the domestic animals are often too small and weak to be of great use as draft animals, and are too few in number to furnish the protein needed by people whose diet is otherwise so starchy.

(5) *Difficulties of Tropical Transportation.*—In most tropical countries transportation is very backward. Heavy rains, superabundant vegetation, weakness among the animals, and lack of vigor and inventiveness among the people make it difficult to build and maintain roads, or to lay up the capital which is essential if the means of transportation are to be permanently effective. For example, on the Madras Railroad in India, 40 per cent of the ties have to be renewed each year; on the Tehuantepec Railway, work had to be suspended because of the loss of workers through disease; and during the building of the Indian railway from the Portuguese port of Goa to the main British system, 63,000 patients were treated. Because of such conditions tropical countries contain scarcely a mile of macadam road, tram line, or railway which has not been either built with capital and machinery from

outside the tropics or superintended and equipped by people from cooler countries.

(6) *Human Health and Character.*—Probably the greatest of all handicaps in tropical regions is poor health and physical inertia, as explained in previous chapters. This works through poor diet, parasitic diseases, poor sanitation, and unhygienic practices, and also through the direct effect of the climate. It apparently applies to tropical races as well as white men, although the data on this point are still scarce. Nevertheless, certain tests made in the United States suggest that the optimum mean temperature for Negroes is 68° or only 4° higher than for white men.

This means that practically all tropical people live permanently in a temperature higher than their optimum. This is much worse than living where the temperature is permanently too low, for in cold places people can create the right temperature by means of houses, fires, clothes, and exercise; whereas no one has yet found any practical means of overcoming the heat. The fact that mental activity is probably most stimulated where the outdoor temperature averages about 40° F. makes the tropical heat still more harmful. When the depressing effect of constant monotony and too much moisture is added to all this, it is not surprising that although tropical people sometimes work long and laboriously, they almost never show the zest and energy characteristic of northerners, and rarely do any deep thinking. With the exception of Mohammed, no great man of the first rank is known to have been born and brought up within 25° of the equator. Even Gautama, the founder of Buddhism, grew up in latitude 27° N. at the foot of the Himalayas.

All this does not mean that the white man cannot successfully carry on business and maintain high standards in tropical countries. The men who maintain such standards through a long life in tropical countries are generally those who pay special attention to keeping themselves "fit." Many keep fit by carefully regulating their diet, by refraining from alcoholic liquors, by having work which interests them and keeps them absorbed, and especially by systematic exercise. Among the native people the same rule holds true. Among those Filipinos who are partly of European descent, many are being built up physically by the athletics which Americans have introduced. There is probably more need of judicious and systematic exercise in tropical countries than in those where the climate is more bracing.

Such conditions mean that every wise business enterprise in tropical countries must do at least four things: (1) it must spend money freely on the health of its employees; (2) it must give frequent and long vacations so that the employees and their families may go home before

they show signs of weakening; (3) it must promote exercise and all forms of wholesome recreation, especially out-of-doors; and (4) every possible effort must be made to maintain high social standards, and the white men must have their own community as separate as possible from the people of the country. Even if men must travel about among the natives they should regularly spend long week-ends in a community of northerners. To some people such precautions seem unnecessary and almost unbusinesslike, but the most successful corporations such as the United Fruit Company are the ones that practice them most fully. They pay in the long run, for the riches of tropical lands are enormous, and the thing that is most needed there is wise efficient. energetic, sympathetic, and reliable men to manage the native labor.

White Labor in Warm Countries.—What is true of white men in the higher positions is far more true of those engaged in manual labor. But the expense of the precautions needed to enable white men to thrive in debilitating climates, especially if their families are to be kept in health and vigor, is so great that few lines of business can afford to keep many white laborers in the tropics. Perhaps some day this will be possible, for in Porto Rico, Cuba, Hawaii, and especially northern Australia, white labor seems to be fairly successful. But compared with other tropical regions all these are unusually favored in both climate and government.

The Improvement of Tropical Labor.—It appears from all this that if the white man is to develop the wealth of tropical countries, one of his first tasks is to take care of the tropical people. Nothing so handicaps and exasperates the tropical planter as the slowness, inefficiency, stupidity, and especially the unreliability of many tropical laborers who work to-day and are idle to-morrow according to their feelings. The foundation of this trouble is partly race, but much of it is health, while lack of training and the absence of strong incentives to work are also important. If white men are to realize the vast possibilities of tropical countries, one of the first steps is to eradicate the worst tropical diseases. Yellow fever has already almost disappeared, but its ravages were unimportant compared with those of the hookworm disease and malaria. With the eradication of disease must go a change in diet so that the tropical laborer will have enough food at all times and a sufficient variety to insure a fair balance of proteids, fats, and carbohydrates, and an ample supply of vitamines. That it is possible to eradicate disease and improve the diet is proved by the experience of the United States at Panama and by plantations run by the British and Dutch in the Malay Peninsula and Java. It is not enough, however,

to help the men who are now actually at work. They have often acquired a degree of inertia and incapacity which they can never overcome. What is needed is to see that the mothers and children are well fed and kept from disease. If a new generation can grow up with relatively strong bodies and with minds that are not benumbed by poor food, malaria, hookworm, and other diseases, they will be better able to profit by the training which many philanthropic people are offering them. Such training needs to be not merely intellectual, but also moral and physical, and should include hygiene and athletics. Healthy tropical children with such a training will presumably grow up not only with better capacities and higher ideals than their parents, but with new desires for the many conveniences and luxuries which serve as incentives to keep the people of more energetic lands hard at work.

Rice Growers; the Highest Native Tropical Community.—Having seen the conditions of agriculture, health, and labor in tropical countries, let us examine the highest type of agricultural community evolved by tropical people unaided by others. The people of such communities raise rice, and are what might be called intensive one-crop horticulturists. They have risen higher than any other type of tropical communities partly because rice is one of the best tropical foods, partly because its cultivation requires more care than that of most tropical crops, and partly because rice users live in compact, permanent communities where the opportunities for progress are especially great. In a typical rice-raising community such as Java, most of the people live in huts made of poles and covered with high roofs thatched with palm leaves or some similar growth. The houses are usually quite close together; there are abundant trees wherever they have not been cut off; and the roads are usually rough cart paths. As a rule the rice fields are terraced. The necessity of terracing the fields, in such a way that water may flow over the rice very gently and pass from level to level, calls for an immense amount of patient labor in fashioning and repairing banks of mud and in arranging canals. The care required in cultivating the land, manuring it, plowing it with bullocks, raising water to the proper level to flood the fields, transplanting the rice when it is partly grown, drawing off the water at the right time to permit the crop to ripen well, and carefully harvesting, threshing, and preserving the grain has greatly aided the development of a rather high degree of industry and skill similar to that found among market gardeners. Though the rice raisers of China and India work slowly, they make much better laborers than almost any other tropical people.

The intensity of the cultivation employed in growing rice may be

judged from a table showing an estimate of the work needed to raise an acre of rice in the sub-Himalayan district of India.

Four plowings, requiring the work of one man and a pair of bullocks for 12 days at 3 cents per day	$0.36
(The fact that a man and his two bullocks require three days to plow an acre illustrates how slowly the tropical people work and how inefficient are their animals and the little wooden plows often not even tipped with iron.)	
Manuring, 4 men for one day	0.08
80 pounds of seed	0.32
One plowing and harrowing after seeding, 3 teams, one day	0.09
One weeding, 20 women, one day	0.40
Repairing levees, 16 men, one day	0.32
Reaping, 16 women, one day	0.32
Carrying to threshing floor, one man and a pair of bullocks, one and one-third days	0.04
Threshing, one day's work of 4 men at 2 cents and 10 bullocks at one cent	0.18
Cleaning and winnowing, 3 men, one day	0.06
Rent of first class land per acre	0.96
Other expenses	0.12
Total expenses	$3.25
Total yield, about 1000 pounds (22 bushels) of unhusked rice or paddy, worth about	3.85
Total number of days of work by men or women	79⅓
Total number of days of work by a pair of bullocks	44

The most significant thing about this table is the great number of people who work on a single acre of land—a result in part of the density of population—and the number of days of work needed to produce a relatively small amount of food. If these people worked 10 hours a day, and they probably work more, each bushel of rice would require about 36 hours of work, or 12 times as much as was needed to produce a bushel of wheat in the United States previous to the invention of modern machinery, and about 200 times as much as is now needed. Obviously people who produce so little in proportion to their time cannot have a large surplus, and cannot demand much from the outside world. Hence, the rice raisers' part in the world's business is very slight.

The prices in the rice table apply to the time before the Great War. Even if doubled or even trebled to meet more modern conditions, they seem so ridiculously low that one wonders how the rice growers can live. Reckoned in purchasing power, which is the best way to reckon wages, the Indian farmer receives less than one-sixth of a bushel of rice per day for his own work or that of his wife, and half as much for the capital represented by each bullock. The real pay of the American farm

laborer, that is, its purchasing power, is perhaps twelve times as great as that of the rice farmer. In other words, because of his greater racial capacity, better climate, and other advantages belonging to his geographical location, the American farm laborer is approximately twelve times as productive as the tropical rice farmer. The need of the farmers for food for themselves and their families is almost the same, but the rice farmer can scarcely satisfy his need, while the American has enough surplus so that he can afford to exchange it for a great variety of foods brought from widely separated places. The American adds to the world's business by spending much money on clothing, rent, fuel, and simple luxuries. The rice farmer and his family make most of their own clothing and house, gather the few sticks that they need for fuel, and contribute only the most meager surplus to the world's commerce, or even to the trade of their own community.

Plantations: The New Type of Tropical Community.—The most essential features of tropical plantations are as follows: (1) they are almost invariably owned and managed by men from the more stimulating climates, chiefly Europeans, North Americans, and men of Spanish descent, but sometimes Chinese or Japanese; (2) they usually raise products whose main use is not to supply food locally, and which are consumed far from where they are produced; (3) they are subject to the difficulties of the one-crop type of agriculture; (4) they are often highly profitable and are perhaps increasing more rapidly than any other type of agricultural community. The chief products raised on plantations are as follows: (*A*) *Spices and Condiments*: vanilla, pepper, cloves, nutmegs and mace, ginger, allspice or pimento, cinnamon and cassia, cardamom; (*B*) *Fruits*: banana, pineapple, avocado or alligator pear; (*C*) *Drinks*: coffee, tea, cocoa; (*D*) *Other Foodstuffs*: sugar, palm oil, copra, and cocoanut oil; (*E*) *Drugs and Sedatives*: quinine, coca, tobacco; (*F*) *Fibers*: cotton, sisal, Manila hemp; (*G*) *Other Raw Materials*: rubber. Other minor products might also be mentioned, for the number and abundance of plantation products is increasing rapidly. Sugar and to a less extent bananas are the only two products which form really important articles of food, and as these contain little or no protein, an attempt to live on them would quickly produce ill health. The other foodstuffs, spices, fruits, and drinks could all be dispensed with without seriously impairing the value of the ordinary diet of any part of the world. In the same way tobacco fills no important need and is entirely a luxury. Thus, in addition to sugar and bananas, the only plantation products that are really essential are the three fibers, quinine as a remedy for malaria, and rubber.

Difficulties of the Planter Who Tries to Raise Food.—In view of

the world's need of more food, it seems strange that tropical countries with all their possibilities have not been more fully utilized. The experience of an American who tried to raise corn in Mexico illustrates the difficulties of tropical farming. This man knew that in Mexico the farmers cling to primitive methods so persistently that "not even a modern hacienda (owned by a man of Spanish blood) can be any more up-to-date than its peons will allow." If left to their own crude methods, the peons plant corn in holes made with a pointed stick or in soil turned up by a plow which, though it scratches the earth only to the depth of a finger, is as large as the underfed cattle can draw. The native hoe weighs between three and five pounds, and harvesting and threshing are done by methods described in the Bible. The American wondered, as others have done, why he could not purchase a farm in Mexico, use scientific methods, and harvest a fortune, since the natives with crude implements and little skill can extract a living from the soil. Accordingly he imported American machinery and was delighted to find that his corn gave promise of yielding in proportion to the excellence of his methods. But he soon discovered how exceedingly discouraging is the gauntlet of handicaps one must run who attempts to raise food in tropical Mexico. Although the Mexican soil and weather gave him a luxuriant growth of corn, it also gave an ant to eat the germs from some of the seeds before they had sprouted, a cutworm and blackbird to attack the seedlings, an army worm to ravage the plants when knee-high, another bird and worm to attack the maturing ears, parrots, parrakeets, and raccoons to devour the ripened ears, and a black weevil to develop in the kernels after they are shelled. Moreover, there is always the danger that the rainy season may begin before the crop is harvested. He also discovered that war on weeds and bushes rather than on men is the chief reason why the Latin-American farmers are constantly armed with their sharp, long-bladed machetes. Sugar planters have indeed overcome many of these difficulties, and if the economic need should arise, they might be overcome for corn also.

All this illustrates the important fact that throughout all but the drier and more elevated parts of the warmer zone the raising of food crops has thus far rarely been successful except in the haphazard way of the primitive tropical farmer or in the highly intensive way of the rice farmer. Tropical countries still await a system of agriculture which shall afford a large yield per acre with a small amount of labor. When that system is perfected the plantations may be expected to raise food as well as luxuries, and to be self-supporting instead of relying in part, as they now do, on cooler climates.

The Sugar Plantations of Cuba.—The sugar plantations of Cuba illustrate the profitable nature of plantation agriculture. According to the official estimates of the Cuban Government, a capital of about $10,000 is needed in order to start a sugar plantation of 100 acres. Aside from the land and buildings, the necessary equipment consists of oxen, a traction plow, and several carts each large enough to require 6 or 8 yoke of oxen. The ground must be cleared, plowed, planted with cane cuttings, and cultivated at least once, but thereafter the canes often choke the weeds. After a year or more the laborers strip off leaves, cut off the tops, and load the canes on wagons, while the leaves and tops are left as a mulch. In Australia, the expensiveness of white labor in the cane fields leads commonly to the practice of burning off the dry leaves instead of stripping them—a method which injures the sugar. The canes are crushed and the juice is reduced to sugar in a large mill equipped with modern machinery. Returns of 50 to 100 per cent on the capital invested are sometimes made, but the crop varies greatly and so does the price of sugar.

The laborers who work on the sugar plantations rarely raise more than a small fraction of their own food, nor do other farmers in Cuba raise a surplus sufficient to feed them. Hence, Cuba's large imports of food. Because Cuba is so dependent on imports, she is vitally interested in the success of the Newfoundland fisheries, the troubles of the Mexican and Texan oil fields whence comes fuel for the tractors, and the strikes of the Pittsburgh district whence comes heavy machinery for the sugar mills and rails for the tramways. Even the variations in American politics may have an immediate bearing on every Cuban sugar grower because of possible changes in the tariff. The importance which the sugar plantations assume in the trade of the United States is illustrated by the fact that a fourth of all the American motor trucks and pleasure cars which this country sells to Latin America go to the one small country of Cuba. In proportion to its population, that country spends more than any other in the American market. The sugar crop alone yielded $107 per capita in 1920–1921.

Sisal and Rubber Plantations.—Other types of plantations are likewise important in the world's business. In Yucatan a peculiar fitness of soil and climate for the henequen plant, a sort of agave resembling the century plant, helps to make that region one of the most prosperous parts of Mexico. The strength and value of the sisal fiber contained in the henequen leaf cause a steady demand for it in the industrial centers and shipyards of the civilized world and especially in the American harvest fields. It is distasteful to crickets and grasshoppers, and hence the bundles of grain tied with sisal are cut by these

pests much less often than are the sheaves tied with cord made of cotton. The large demand for sisal has not only created many Spanish millionaires in Merida, the capital city, but causes Yucatan to stand next to the Tampico oil region as a part of Mexico in which Americans are much interested.

In the same way, the demand for rubber and the suitability of soil and climate for the rubber plant on islands like Sumatra have caused millions of dollars of American and British money to be invested in the groves of rubber trees cultivated on these islands. There, more than in most plantations, the foreign owners have taken great pains to improve the conditions of health by draining marshy places, putting some of the brooks under ground, and providing medical attendance, hospital care, and above all complete isolation from mosquitoes for the sufferers from malaria. Such activities pay, and are making the plantation owners realize that the system of virtual peonage which prevails on many old-fashioned plantations, as in Mexico where the Yaqui Indians were treated almost as slaves, is a financial as well as a moral mistake. This growing realization of the importance of health and efficiency is one of the most hopeful signs within the tropics.

To-day the plantations are chiefly found on seacoasts, especially on the islands of the East and West Indies. The coasts are not only the regions where level plains are most easily accessible, but where the conditions of health are best, aside from the highlands. Little by little the plantations tend to move inward. Thus tropical countries are being invaded by influences which gradually tend to promote health, increase the capacity of the people, make them more capable of receiving education and training, and raise their standards of living.

EXERCISES AND PROBLEMS

1. Study the distribution of rice culture. On a map of the world shade the rice-producing countries (Table 11) in three grades according to the production per inhabitant (Table 12): (1) Under 10 pounds per person (10,000 pounds per 1000 persons), (2) 10 to 100 pounds per person, and (3) over 100 pounds. What geographical or other conditions pertain in common to all the countries in any one of these three grades? On another map shade the rice-producing countries in three grades according to their production per acre (Table 12): (1) Under 1000 pounds per acre, (2) 1000 to 1500, and (3) over 1500. What conditions pertain in common to all the countries in each grade? Explain the main differences between your two maps, paying special attention to the effect of climate versus stage of progress.

2. Study sugar culture (Tables 11 and 12) in the same way as rice culture. Explain why certain countries have so marked a preponderance in this product. On the basis of latitude and of your general knowledge, draw a line separating cane sugar from beet sugar. The *Geography of the World's Agriculture* will help you in

this. Write an account of the geographical contrast between the regions most favorable to each of the types.

3. Let several students work together to compare various countries as to their importance and progress in tropical agriculture. From Table 12 make a table of all the countries which annually produce over 20,000 pounds of rice and 5 tons of *cane* sugar per 10,000 people. Add all the information available in Tables 11, 12, 15, and 16, and also Tables 1 and 9. Discuss the indications of your table as to the relative productivity and progress of the regions where tropical agriculture is best developed.

4. *The Effect of Vegetation on Tropical People.*—Prepare a generalized map of the density of vegetation within the tropics (see Philip's Comparative Wall Atlases) and a map of density of population (Table 1). Under what conditions of vegetation are the tropical countries most densely populated? What tropical industries are best suited to each type of tropical vegetation? Locate on the map the large tropical cities (Table 4). What conditions have a special effect on the growth of cities in the topics?

5. Obtain all the information possible from the tables in this book and elsewhere relative to the Belgian Congo. Prepare a statement showing the effect of geographical conditions in that country.

CHAPTER XIX

FORESTS AND THE LUMBER INDUSTRY

The Distribution of Forests.—Among the world's raw materials, wood ranks with iron as one of the most essential. The general distribution of the forests from which this important material may be secured is shown in Fig. 98. A great northern area is separated from a great tropical area by vast tracts where forests are scarce either because the population is dense as in central Europe, China, and the plains of

From Zon and Sparhawk: Forest Resources.

FIG. 98.—World Map of Forests.

India, or because the climate is unfavorable as in the Mediterranean lands, the southwestern United States, and the great deserts of North Africa and central Asia. The division of the world's $7\frac{1}{2}$ billion acres of forest area among the continents is shown in Fig. 99. Although Asia has the largest forest area, about 2100 million acres, its enormous deserts in some parts and the density of population elsewhere cause it to have only about 22 per cent of its area in forests, as appears in *B* of Fig. 100, while North America has 27, Europe 31, and South America 44. On the other hand, Australia and Africa have such huge

deserts that their forest areas comprise respectively only 15 and 11 per cent of their total area. A more important consideration, so far as industry and commerce are concerned, is seen in Fig. 100, which shows that Australia has about 35 acres of forest per inhabitant, South America 32, North America 10, and Africa less than 6, while Asia has only 2.4 and Europe 1.7.

The area of forests in individual countries is illustrated in Fig. 101. Russia and Siberia stand first, as is generally the case where questions of mere area are concerned. The British Empire comes second, for although 95 per cent of the original forest has been removed in Great Britain itself, Canada has nearly 600 million acres of forest (see Table 22 in Appendix), British Africa 350, Australia 90, and even populous India 40. Brazil, with approximately a billion acres of forest, considerably outranks the United States with 550 million acres at home,

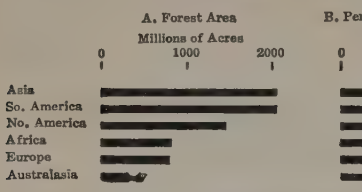


FIG. 99.—Distribution of Forests by Continents.

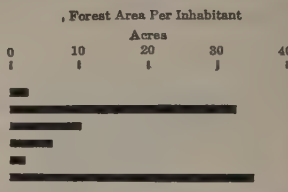


FIG. 100.—Forests per Capita by Continents.

95 million in Alaska, and 38 million in the Philippines. Originally, however, the two were nearly equal, for Brazil has as yet removed only a small percentage of its forests, while the United States has permenently cleared about 40 per cent. These four political units—Russian, British, Brazilian, and American—possess nearly two-thirds of the world's forests. The remaining third is divided among about fifty countries. The most progressive countries control the world's forests much as they control its minerals, manufacturing, and commerce. Great Britain, France, Belgium, and the Netherlands have within their own borders only 0.4 of 1 per cent of the world's forests, but they control more than 30 per cent in their colonies and dependencies.

The Three Great Types of Forests.—The forests of the world fall into three main classes: (1) coniferous softwoods, (2) temperate hardwoods, and (3) tropical hardwoods. The softwoods consist mainly of pines, firs, spruces, larches, cypresses, and junipers. Some of the more important temperate hardwoods are oak, birch, beech, maple, ash, walnut, and sycamore. The tropical hardwoods include a great variety of species, many of which are more or less inaccurately called by such

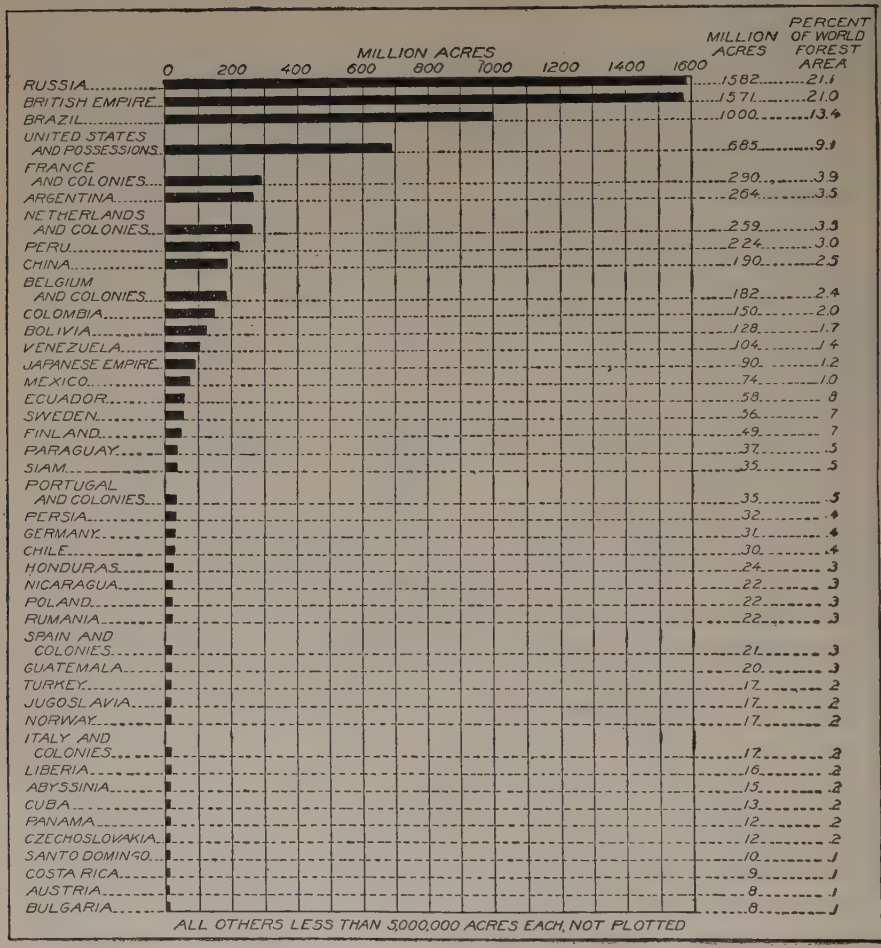
names as teak, mahogany, ebony, rosewood, and dyewood. The distribution of the two types of hardwoods is quite distinct, being mainly determined by climate. The conifers as a rule occupy regions of lower temperature than the temperate hardwoods; but in large areas, especially in the regions where civilization is now highest, the two are considerably mixed, as in the northeastern United States. When the mixed virgin forest in such a region is cut, hardwoods regularly predominate in the newer growth. The general distribution of the three types in the various continents may be judged from Fig. 98 and also from the following table, which gives the area of each type in millions of acres:

	Conifers	Temperate Hardwoods	Tropical Hardwoods
Europe	579	195	0
Asia	889	572	635
Africa	7	17	773
Australasia	15	15	253
North America	1046	290	108
South America	109	115	1869
World	2645 (35%)	1204 (16%)	3638 (49%)

Europe has mainly conifers with some temperate hardwoods; Asia has approximately the same acreage of all three; Africa and Australia have little except tropical hardwoods; North America has all three kinds, but chiefly conifers; South America likewise has all three, but with an overwhelming predominance of tropical hardwoods. The different uses and different rates of growth of the three types of wood cause their distribution in individual countries to be extremely important (see Table 23).

For most purposes mankind prefers softwood. The conifers can be felled, trimmed, sawed, and worked so much more easily than either the temperate or tropical hardwoods, that they are the first choice for an overwhelming majority of uses. About 95 per cent of the coniferous forests are located between latitudes 30° and 60° N. and hence in the regions where human progress is most active. It is not surprising, then, that they have been exploited on an enormous scale. One-half of all the world's wood and three-fourths of all the saw timber, or logs that are fit for the sawmill, is to-day cut from coniferous forests. The temperate hardwoods are cut to a much smaller extent. In the United States, for example, the cut of softwoods since 1921 has averaged about five times as great as that of hardwoods. In the world as a whole, the temperate hardwoods may furnish 40 per cent of the total cut, for Europe uses much hardwood for fuel, but they probably do not

supply much more than 20 per cent of the saw timber. The tropical hardwoods are only beginning to be used. At present they supply perhaps 9 per cent of the total that is cut for all purposes, and 3 per cent of the saw timber. In Fig. 102 note the relative insignificance of the cut



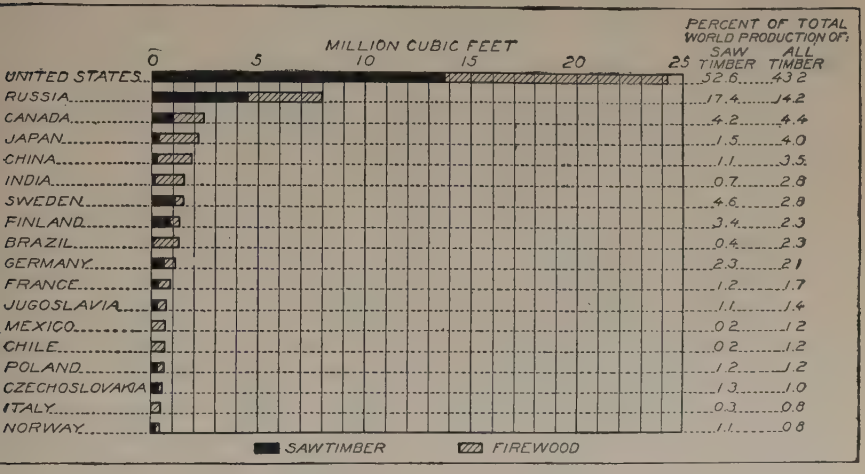
From Zon and Sparhawk: Forest Resources.

FIG. 101.—Area of Forests in Chief Countries.

of timber in countries producing tropical hardwoods. Note also how enormously the United States is over-cutting its timber in proportion to its resources as shown in Fig. 101.

The Optimum for Conifers.—Each species of tree has its own optimum of climate, soil, and relief. Nevertheless, it is possible to

define certain conditions under which each of the three great groups of trees makes the most rapid growth. The conifers are most widespread in cold, snowy regions like Siberia and Canada. The largest and most rapidly growing species, however, are found in lower latitudes where the altitude or the position in respect to the ocean gives them cool, moist summers and snowy winters. The slopes of the Himalayas at altitudes of 5000 to 7000 feet around Kashmir, certain remote mountains in the far west of China near the Tibetan border, the Andean slopes of southern Chile, and the ocean-girt mountains of southern New Zealand illustrate the type. The most familiar example is the western parts of the states of Oregon and Washington. There grow



From Zon and Sparhawk: Forest Resources.

FIG. 102.—Cut of Lumber in Chief Countries.

the Oregon pine, or Douglas fir as it really is, which to-day rivals the southern pine as a wood available in large quantities for general purposes, and the Washington spruce, the best kind of wood for airplanes, where lightness, strength, and freedom from knots must be combined. Not far away in similar climates grow the great redwoods of the California coast; and at higher levels the giant sequoias, 300 feet high and 20 or even 30 feet in diameter at the base, and often 2000 or even 3000 years old. In general, the regions where soft conifers grow most rapidly and hence yield most per acre have a summer temperature averaging not over 60° F. and a winter temperature varying from about 15° to 32°. In summer they are so moist as well as cool that they are not good for the majority of crops. In winter the main requisite appears to be that they be either so cold that snow lies on the ground

many months or else so rainy that the ground is soaked with water practically all the time.

The Optimum for Hardwoods.—The temperate hardwoods—deciduous trees, which drop their broad, flat leaves each year—find their optimum in such places as the deep-soiled, well-watered lowlands of the southeastern quarter of the United States. Much of this area, however, has been cleared for agriculture and now the large deciduous forests lie chiefly among mountains. Almost nowhere do great oaks, beeches, maples, chestnuts, tulip trees, ashes, and other such trees make a finer growth than in North Carolina at the eastern base of the southern Appalachians. There the trunks of the trees often rise straight up 50 or 75 feet before branching, and sometimes continue another 50 above that. In summer the climate is warmer and rainier than that of the Oregon region most favorable to the conifers. That is the chief reason why deciduous trees rather than conifers prevail. Here, as in Oregon, the presence of the mountains, causing abundant rain, helps in producing excellent stands of timber.

A still better region for the broad-leaved trees is that where the optimum for the tropical hardwoods is found. The ideal combination appears to be temperatures above 70° at all seasons, but not often above 90°, abundant rain at all seasons, plenty of sun, deep soil, and good drainage. Such conditions prevail, for example, at the eastern base of the Andes in the Amazon basin. At what would otherwise be a dry season, the great height of the Andes forces the easterly trade winds to begin to rise far out on the plain, and thus helps to produce abundant moisture where the soil is deep and the temperature high. Another important feature is that in such tropical regions, even in the rainiest seasons, the clouds generally clear away at night, and there is bright sunshine during the morning. Not till the plants have had a good amount of sunshine do the clouds gather for the afternoon showers. As yet the demand for lumber is not strong enough to cause the hardwoods of the moist tropical regions to be cut extensively even in the plains, but as time goes on the lower parts of the moist, rugged tropical regions will presumably rank among the world's greatest timber regions. Students of forestry have found that a given area near the eastern foot of the Andes in Brazil, where the drainage is good, where showers are frequent, and where the sun shines warmly, produces two to six times as much wood each year as the best deciduous areas in the Appalachians.

The Growing Demand for Wood.—Each advance in material civilization seems to create a greater demand for wood (Fig. 102). Coal, to be sure, has now been substituted for wood as fuel by hundreds of

millions of people, and iron, brick, concrete, and stucco often take its place as structural materials. In carriages, railway cars, ships, and other means of transportation, a similar curtailment has occurred. Nevertheless, not only the total demand but the demand per capita keeps on increasing. This is partly due to the great number of new uses for wood. To take a single example, here is the per capita consumption of pulp wood cut from the trees of the forest and used in the United States:

Year	Per Capita Consumption of Wood for Paper	Year	Per Capita Consumption of Wood for Paper
1879	18 cu. ft.	1909	93 cu. ft.
1889	36 cu. ft.	1919	124 cu. ft.
1899	57 cu. ft.	1923	169 cu. ft.

At this rate the half century from 1879 to 1929 will witness more than a tenfold increase in the use of paper and a corresponding increase from a consumption of about 700,000 to 7,000,000 cords of pulp wood per year.

The consumption of wood varies enormously. In Egypt, practically no wood is available, but almost none is needed for heating purposes or industries, only a little is required for cooking, and the consumption is estimated as only 2 cubic feet per capita each year. In cooler and more advanced countries like England and the Netherlands, where the supply of wood has for centuries been insufficient, the widespread use of coal for fuel, and of brick and tile for buildings, keeps consumption below 20 cubic feet per year. In the United States, on the contrary, although the per capita consumption of coal is larger than almost anywhere else, the abundance of wood, the demand for it in manufacturing and in the construction of new buildings, and its widespread use as fuel among farmers raise the consumption to about 230 cubic feet. In Finland, where the supply is more accessible than in the United States and also more abundant in proportion to the population, and where the very severe winters and the scarcity of coal lead to a large demand for wood as fuel, the annual consumption attains the extreme figure of about 300 cubic feet per capita.

The Future Supply of Timber.—The alarming feature of all this is that in many parts of the world the consumption decidedly exceeds the growth. For example, in the United States it is estimated that the amount cut each year is nearly six times as great as the growth during the same period. Similar conditions prevail in other northern countries. On the other hand, in the tropical parts of South America, Africa, southeastern Asia and the East Indies, the forests grow with great rapidity,

while almost no timber is cut. This is natural, for the climate not only stimulates growth and makes firewood almost unnecessary, but also retards civilization and thus restricts the use of fuel in transportation and manufacturing.

Although Fig. 98 shows the general distribution of forests throughout the world, it does not show the amount of timber available. In large parts, although by no means in all, of northern Canada, Alaska, northern Russia and Siberia, the timber is merely a small growth fit for little except pulp wood. It grows so slowly that after an area has been cut over, new trees do not attain even the small size needed for pulp wood in much less than half a century. In the tropical regions, on the other hand, the trees often grow to a height of 100 feet or more in less time than it takes for the northern trees to attain a height of 20 or 30. Obviously then, the heavily shaded areas in Fig. 98 differ greatly in value as future sources of timber.

Where will the future timber supply of the world come from? With the growth of population, the area of forests has greatly diminished and will doubtless continue to diminish, although that diminution will presumably be slow in well-settled countries. Elsewhere, however, it is likely to be rapid. Even now in Australia one can see thousands of acres where the trees, after being girdled by cutting the bark near the base, are left standing to rot in order to clear the land for pasturage. Nevertheless, there are still 4.4 acres of forest for each person in the world. Such an area is capable of producing many times the present consumption of wood, which amounts to about 32 cubic feet per capita each year. This is approximately $7\frac{1}{2}$ cubic feet per acre of forest, but the average growth in well-managed coniferous forests amounts to 60 or 80 cubic feet. In Finland, for example, the average for poorly managed as well as carefully managed forests is 33, in France 38, in Germany 50, in Lower Austria 51, and in Belgium 57. In tropical countries this figure is capable of being increased several-fold, although nothing of the kind has yet been done. Thus the prospects for an ample supply of lumber in the future are good.

For the present the main problem is transportation. Excellent transportation facilities are one of the chief reasons why Washington and Oregon supply enormous quantities of lumber not only to the northeastern United States, but to China with its depleted forests, and even to forested Japan when a great calamity like the earthquake of 1923 causes an unusual demand. In the same way, good transportation facilities make it possible for Europe, with its favorable climate and progressive forestry system, to supply timber to South Africa where the climate is unfavorable.

Siberia, with over a billion acres of forest, could probably export six billion cubic feet of timber a year, or one-fourth of the world's present consumption of timber, and yet not deplete its resources, if they were properly managed. The tropical rain forests of Africa, with 350 million acres, of Asia and the East Indies with 500 million, and of South America with 1000 million, if fully developed and fairly well handled, could produce each year from 200 to 250 billion cubic feet of wood, or perhaps four times the present consumption of the entire world.

But the prospect is by no means as rosy as this would indicate. In the first place, transportation facilities are very poor in most of the regions where there is a great surplus of timber. Moreover, the labor is inefficient and it would be difficult to introduce the proper kind of labor from other countries. Another difficulty lies in the character and rate of growth of the wood. In the coniferous forests that are not yet exploited, the growth of trees is generally slow because of the cold climate. The tropical forests present a twofold difficulty. First, they do not contain large stands of a single kind of tree as do the coniferous forests. Few buyers want to purchase mixed lots of timber containing many species. Therefore in cutting the virgin tropical forests it is necessary to work on one species at a time, or else to take a great deal of pains to keep the kinds separate. Both methods are expensive. Again, the hardness of the wood of the tropical forests not only adds to the expense of cutting and preparing the lumber, but makes the wood far less useful than that of the soft conifers. The net result is that the development of tropical forests is likely to be slow so long as conifers are available.

The consumption of wood, like that of practically every other commodity, tends more and more to be concentrated in a few highly active industrial areas. For the present the needs of such regions can apparently best be met by a more rational forestry practice in the two and a half billion acres of coniferous forests. In other words, although improved transportation facilities and the development of tropical forests are undoubtedly great factors in determining where the future timber supply shall come from, good forestry methods in the coniferous areas may be a still greater factor. The distribution of timber production in the future appears to depend largely upon whether timber is looked upon as a resource like the minerals, which is mined once for all, or as a crop to be cultivated and harvested year by year.

Why Lumbering Communities are Relatively Backward.—It is well to examine the effect of forests not only in controlling the geographical distribution of the lumber industry, but also in causing certain well-defined social and economic conditions to have a similar distribution. In studying the communities dependent upon animals and upon tropical

agriculture, we saw that permanence of residence is a potent factor in the evolution of civilization. Almost no type of civilized community is more transitory than the lumbering community, and the standards of living are correspondingly low. This is because lumbering has hitherto been, in most cases, not only an *extractive* but an *exhaustive* industry. Like hunting, fishing, farming, and mining, the lumbering industry extracts from nature a primary product. Except under modern methods of forestry, it also exhausts the supply of nature's gifts without making much effort to replace them. Thus for centuries the world has been growing poorer in forests almost as rapidly as in minerals, and far more rapidly than in animals, fish, or soil.

The rapidity with which lumbering exhausts the supply of trees in a given region causes the industry to be highly transitory. As soon as the merchantable timber has been cut off within easy reach of a camp, the lumbermen must move on or be idle. The work of cutting the timber proceeds so rapidly that it is not worth while to build good houses, and the lumbermen live in rough shacks or log cabins. In many cases the men are housed in long bunk-houses, which are not much more than closed sheds containing bunks along the sides where a score or more men can sleep in one room. Only when the policy of forest exhaustion gives place to conservation and slow steady use of the timber can the lumber industry become permanent and thus maintain high standards of living.

How Sweden Tries to Raise the Standard of the Lumbering Industry.—In almost no country are the problems of the lumber camp relatively more important than in Sweden. There lumbering is the most important industry aside from agriculture. The saw mills and planing mills alone employ about as many men as all the iron mines, smelters, steel mills, and machinery factories for which Sweden is famous. Accordingly the Swedes are doing their best to make lumbering as permanent an industry as possible. The many short parallel rivers running southeast across Sweden to the Baltic Sea furnish transportation for the lumber in such a way that if a company obtains control of a considerable part of one of the relatively small watersheds it can generally find a single convenient location for its saw mills, furniture factories, and paper plants on the lower part of the stream, and thus give great permanence to all parts of the work except the actual cutting of the trees. In many cases the Swedish lumber crews are considered permanent labor, and some saw mill companies furnish houses and gardens for their men.

This attempt to make lumbering a permanent occupation for the sake of labor is accompanied by a similar attempt for the sake of making

the land yield a steady return. Good forestry practice in the United States as well as in Sweden and other European countries means that the trees are not all cut at once. Only mature trees fit for lumber are cut, while young trees are allowed to grow. In the long run this is profitable, for it means that a steady supply of good trees is available year after year from a wide area instead of an equal number of trees partly good and partly bad from a smaller area. Moreover, it permits the most desirable kinds of trees to be raised almost everywhere. The present practice is bad because of what is known as the "succession" of vegetation. When a piece of forest is cut off, the trees that spring up are not necessarily of the same variety as those that were cut. For example, suppose that a forest of white pine, which is one of the most valuable trees, has some admixture of hardwoods such as maple, beech, hemlock, and yellow birch. When it is cut, the new forest is likely to contain relatively little white pine and much hardwood because hardwood seedlings, being relatively tolerant, as the botanists say, are more numerous in the shady places of a well-established forest than pine seedlings. If the hardwood forest is cut off and burned over, as often happens, the next growth will contain a large percentage of such relatively poor species as birch and aspen, because these can thrive in an impoverished soil better than can the hardwoods. Another cutting and another fire will increase the percentage of birch and aspen. Thus as a general rule the second growth is not so good as the first, and the third and fourth are still less valuable. But with proper forest conservation, there is nothing but growth of the desired type. Often where no conservation is practiced and big companies have swept away the most valuable trees of the virgin growth, small companies have to be content with the second growth, while the third is cut only for pulp wood for paper.

Transportation and the Lumber Industry.—Few industries depend upon transportation more closely than does lumbering. In the first place, the product is bulky and heavy in proportion to its value. In the second place, lumber comes largely from rugged or backward regions where the population is scanty and the roads poor; and third, practically none of it finds a market where it is cut, for the consumers live chiefly in the lowlands and the cities.

Among the lumber camps the methods of transportation show interesting differences according to climate. In snowy regions like New England, Wisconsin, Sweden, Canada, and Russia, the commonest form of transportation is by sledges over the snow in winter and spring. This is cheap because the deep snow covers all the irregularities of the ground, even the stumps left in the rough wood roads. When packed

by the runners of the two- and four-horse sleds, and especially when watered to produce ice, the snow forms a glassy pavement over which enormous loads can be hauled with ease.

Wherever possible, the lumberman makes use of kinds of transportation in which he has no expense for power. A vast amount of lumber is floated down rivers, especially in snowy and glaciated regions. The snow helps by creating spring floods which make many small streams temporarily large enough to float logs. Glaciation has helped by making the topography irregular and thereby increasing the number of streams and also lakes. The lakes of glaciated regions like Sweden, New England, and Minnesota, likewise assist in lumbering, for they form collecting basins in which the trees from the surrounding areas can be gathered either for a saw mill, or preparatory to being floated farther toward the sea. In a rugged region the logs are slid down over the snowy hillsides, or else chutes are used. These are merely steep troughs down which the logs slide to the foot of the slope. Flumes are also common and are much better than chutes. These are troughs into which a mountain stream is turned so that the logs float down to a lake, river, or mill.

In the South and West where there is little snow and where the trees are often of great size, transportation is more expensive than in New England and Minnesota. Huge pairs of wheels are used and the logs are fastened beneath the axle. Sometimes only one pair of wheels is employed and one end of the log is allowed to drag behind, but often the log is suspended from two pairs of wheels. In the bigger camps these methods of hauling by means of animals have almost wholly given way to steam power or tractors. Donkey engines, for example, snake the logs through the forest as already described, and then by means of a skidder, which is something like an electric crane, dump them on to flat cars or into chutes or flumes.

In places where rivers are not available, it is necessary to construct logging railroads. These are generally of flimsy construction, for the owners do not expect to use them long. As forest conservation becomes more general, the roads and railways in the forested areas improve. In fact the greatest hope of making lumbering a permanent occupation, and hence desirable from the social standpoint, seems to lie in having such transportation facilities that logs from any part of a forest can easily be transported to market, while the lumbermen can get to any desired region so quickly that they can live at home and devote part of their time to farming. The old-time isolated lumber camp, with its abuses, is disappearing. Its place is taken by a much more permanent and useful type of community.

Effect of Transportation on Ownership of Lumber Industry.—Transportation is in many respects the key to the lumber industry. For instance, the lumberman who wants to use a river must not only own the rugged region where his trees grow, but must own or rent an area beside the river as far down as possible in order to set up his saw mill. This gives the big company with much capital a great advantage over the small one. Again, the big company has an overwhelming advantage over the small one if railroads are needed, for the initial investment is so high that much land must be owned in order to make them pay. If the investment in railroads is heavy, it does not pay to move the tracks oftener than once in about twenty years. Hence, large companies seek to protect their railroad investments by buying up the timber for many miles around their mills. This is one reason why much of the timber of the United States is in large holdings. In fact about 11 per cent of all the privately owned trees in the country belong to three such companies. Small lumber firms who bargain every two or three years for a supply of standing timber can rarely cut cheaply enough to compete with large companies. Often the best they can do is to invest in portable saw mills, buy the cut-over lands at low prices, and make their profits from the second and third growths. The worst feature of the lumber industry, so far as ownership is concerned, is that vast holdings have been acquired by private interests which have paid little or even nothing for them, and are chiefly desirous of making fortunes regardless of whether the forests are ruined. In the United States, the Government forest reserves, established to counteract this difficulty and prevent its continuance, now number 168 and include over 290,000 square miles or nearly 10 per cent of the country. In tropical countries and likewise in the far northern coniferous areas most of the forests are still owned by the Government.

EXERCISES AND PROBLEMS

Note.—Before working out the following problems it may be well to study the pages on lumbering in Chapter XXIII, or these problems may be deferred till that chapter is studied.

1. Production of lumber by states. From Table 24 C draw a map using the following symbols: solid rectangle, one billion board feet (one thousand million); solid square, 500 million; solid triangle, 200 million; circle, 5 million or less. Define the conditions of five chief areas of production from the standpoints of (*a*) climate, (*b*) relief, (*c*) density of population, (*d*) length of settlement, (*e*) facilities for transportation to regions of great lumber consumption. Explain the probable reason why North Dakota is omitted in the tables of the United States Forest Service.

2. Relation of production of lumber to density of population. From Table 24 D draw a shaded map with isopleths at 100, 200, 400, 800. Explain the scanty pro-

duction per person from southern New England to Utah. How many factors play a part in this, and which is most important in each region?

The average consumption per person in the entire United States is far greater in the manufacturing than in the agricultural sections. What parts of the United States raise more than the average per capita consumption? To what extent is the present distribution of an excess of production over consumption favorable to the progress of manufacturing?

3. Lumber production in 1922 in per cent of maximum. From Table 24 E draw a map with isopleths at 25, 50, 75. What states are included in the areas of extreme diminution in the cut of lumber? Are these regions of great demand? How great is their total normal production (Col. A), and their production per capita (Col. D)? Is the diminution there as important as in the areas where the cut in 1922 was from 25 to 50 per cent of the cut in 1910? How significant is the production where it rises over 75 per cent? Explain. In what three states is increased production of much commercial importance? Sum up your conclusions as to the present status of the lumber industry in the United States and the prospects for the future. Take into account the following figures in thousands of board feet showing the total production of lumber in the United States at various periods:

1880	18,087,000	1900	34,781,000	1915	37,012,000
1890	23,495,000	1910	40,018,000	1922	31,570,000

The increase from 1880 to 1910 is the natural result of the growth of the country in population, manufacturing, etc. Explain the decline since 1910.

CHAPTER XX

THE DISTRIBUTION OF MINERAL PRODUCTS

The Relative Value of Minerals and Organic Products.—Table A (page 9) gives 3315 million dollars as the total value of the annual production of metals, and 1210 million for non-metallic minerals other than fuels. The two together amount to $4\frac{1}{2}$ billions. This seems small compared with $6\frac{1}{2}$ billion for fuels, nearly 27 billion for animals, and 56 billion for plants excluding those fed to animals. But does $4\frac{1}{2}$ billions represent the true importance of the minerals other than fuels? Yes, if we are estimating the work done each year to get them. No, if we consider their actual use. Metals, stone, cement, and certain other mineral products are extremely durable; a knife, an engine, a concrete bridge, a stone house, or a factory built of brick can be used thousands of times and may last decades or centuries. Those in use at any given time represent the production of many years. Food and fuels, on the contrary, serve their purpose once, and that is all. Clothing and rubber goods last longer, but rarely more than a few years. Wood stands almost alone among the important vegetable and animal products in being durable, but it does not rival metals, stone, and cement. The durability of mineral products causes them to assume a steadily increasing importance as a factor in human activities.

All this makes it clear that in studying the geographic distribution of minerals, we must consider not only the places where new materials are produced and then consumed in the limited sense of being manufactured, but also the places where the old materials are stored in the useful form of machines, tools, cars, factories, bridges, roads, and the like.

The Natural Distribution of Minerals.—(1) *Relation to Relief.*—The distribution of mineral production is quite unlike that of plants and animals in two main respects. (*a*) Minerals occur here and there all over the earth with little regard for laws such as those of limits and optima. (*b*) If a mineral does not exist naturally in a given region, no amount of human effort has yet been able to produce it commercially, whereas the vast majority of crops and domestic animals are raised in places where the various species did not live until introduced by man.

In spite of the absence of definite laws such as control the distribution of plants and animals, a few broad generalizations may be made in respect to the natural distribution of minerals. The degree to which the rocks have been faulted, folded, and otherwise disturbed has a close connection with the occurrence of minerals. Metallic minerals occur mainly where the strata have been much disturbed, which accounts in part for their greater abundance in rugged regions than in plains, as explained in a previous chapter. On the other hand, mineral fuels, aside from anthracite, occur chiefly where the strata have been little disturbed, and where the relief is gentle or assumes the form of a more or less dissected plateau, as in many coal fields. Other nonmetallic minerals—stone, cement, sand, gravel, clay, salt, and the like—are as a rule widely distributed, with relatively little reference to the degree of disturbance of the rocks, or even to relief in many cases.

(2) *Climate and the Formation of Ores.*—Metallic minerals are more apt to be concentrated in rich ores in dry regions than in moist. Although many parts of the earth that were once dry are now moist, and vice versa, certain continental areas, especially in latitudes 25° to 45° or thereabout, appear to have been persistently dry for millions of years. In many cases the dryness has been accentuated by the presence of mountains which shut out the moisture from the oceans.

In order to understand just how dryness influences the distribution of metals it is necessary to recall the methods by which ores are formed. Most of the igneous rocks which constitute the main mass of the earth's crust contain very small quantities of many metals, mainly in oxidized form. How minute these quantities are may be judged from the fact that whereas aluminum is estimated to constitute between 7 and 8 per cent of the earth's crust and iron over 4 per cent, copper probably forms only one part in 10,000. None of the other metals listed in Table 26 in the Appendix constitutes much more than a mere trace in the average igneous rock within 10 miles of the earth's surface. Except for iron and aluminum, the quantities found originally in the igneous rocks are seldom great enough to be profitably extracted unless the metals have been concentrated by some process of nature. Even with iron and aluminum a process of segregation is usually needed whereby the metallic compounds scattered through a great mass of rock are brought together into ore bodies of appreciable size.

The process of segregation is extremely important, for without it the metals could scarcely be used by man. It is also extremely slow—a matter of millions of years. It takes place in two chief ways. The first and more important is through the action of water. As water percolates through the rocks it dissolves the widely scattered oxides,

sulphides, or other compounds of the metals, and later deposits them after the solution has become concentrated by the addition of material from a wide area. Water-formed ores are of two classes. One is formed at considerable depths by hot water given off from the igneous rocks themselves. This magmatic water, as it is usually called, generally carries the metals upward, and this process has given rise to much of the world's metallic wealth, including practically all the copper of the United States, the gold veins of California, the silver deposits of Cobalt in Ontario, and the lead of Germany. When the water reaches a certain level, the dissolved metals are partially deposited, thus giving rise to a zone of deposition. This is commonly located where the surface water and the magmatic water from below come in contact. Since the water level in dry regions is much lower than in moist, and also much more variable in position, the zone in which ores may be deposited in arid lands is relatively extensive. This is one reason why rich metallic ores are more abundant in dry regions than in moist.

Ores of a less important type are sometimes formed by water that percolates downward from the surface, dissolving particles of metal as it goes and depositing them at lower levels. The opportunities for the formation of such deposits are greater in dry regions than in moist. The large lead and zinc deposits of the Mississippi Valley in Wisconsin, Illinois, and Missouri were formed in this way.

The other chief way in which ores are segregated occurs when masses of molten rock push up through the earth's crust. Often, although not always, they reach the surface in volcanoes. Occasionally during the vast periods while such a mass is slowly cooling below the surface, certain metallic minerals which form crystals at high temperatures solidify before the others. They collect near the relatively cool margins of the molten mass and finally come to rest as bodies of ore. The magnetic form of iron—magnetite—which occurs abundantly in Sweden, is the commonest mineral of this type. In other cases the gases which accompany a rising mass of molten rock contain metallic vapors. If the surrounding rock is of the right kind, especially limestone, the vapors may be deposited to form a zone of ore bordering the igneous intrusion. Iron and copper ores are the commonest minerals formed in this way, but lead, zinc, and gold may also occur.

Surface water may cause the local enrichment of ores formed in either of the preceding ways. By trickling down through the ores it may dissolve metals from the upper parts and deposit them lower down. Such secondary enrichment is especially likely to occur in dry regions. It produces relatively small bodies of extremely rich ore like the upper parts of the Arizona copper deposits and the famous Comstock silver

lode in Nevada. It also produces great bodies of low-grade ore whose aggregate value is enormous. The great iron deposits of Lake Superior are supposed to be due to the action of water in a relatively dry and much-folded mountain region of pre-Cambrian times.

The distribution of coal, as well as of the metallic ores, seems to have some relation to climate. In general the world's extensive deposits of good coal lie in latitudes higher than 35°. The vast zone within 35° of the equator does indeed contain numerous deposits, but the great majority are small or of poor quality as in the thick beds of brown coal in Sumatra. On the other hand, coal of good quality appears to be abundant not only in latitudes 35° to 50° N. in the United States, Europe, and Asia, but in far higher latitudes. Contrary to general opinion, most of the world's coal does not appear to have been formed in tropical climates but in those of a mild, temperate character, fairly warm and moist, but not hot. Such climates apparently prevailed in middle and fairly high latitudes throughout most of geological time. Extreme cold or aridity prevents vegetation from growing with sufficient rapidity, while steady high temperature causes the dead plants to decay so rapidly that coal cannot be formed even where vegetation is luxuriant, as in the Amazon Valley. Most geologists believe that the world's climate is now more severe than when the coal was formed. Hence most of the world's good coal is found in regions that are either fairly cool like the northern United States, England, and North China, or cold as in Siberia, Sakhalin, Spitzbergen, Alaska, and the islands north of Canada.

The Importance of Conservation.—The preceding discussion is less important as a guide to the distribution of minerals than as a means of emphasizing the necessity of conservation. The happy-go-lucky person who says, "Don't worry! There are plenty of ores still to be discovered, and anyhow our descendants will find out how to get all the metals they want," simply displays his ignorance. Such authorities as Professor C. K. Leith believe that although new and important mineral deposits will probably be discovered, the exploration of the earth's surface has now gone so far that there is little chance of finding great deposits such as the coal of the United States and China, the iron of Lake Superior, the copper of Chile, and the gold of South Africa. Even if new discoveries should double the known reserves, which is extremely unlikely, the problem of conservation would not be appreciably altered. The fact that we must face is this: Although new ores may in due time be segregated by nature, that will take millions of years. Meanwhile we are using up our mineral resources at a rate which may mean serious shortage along many lines in a few generations. A knowledge of how

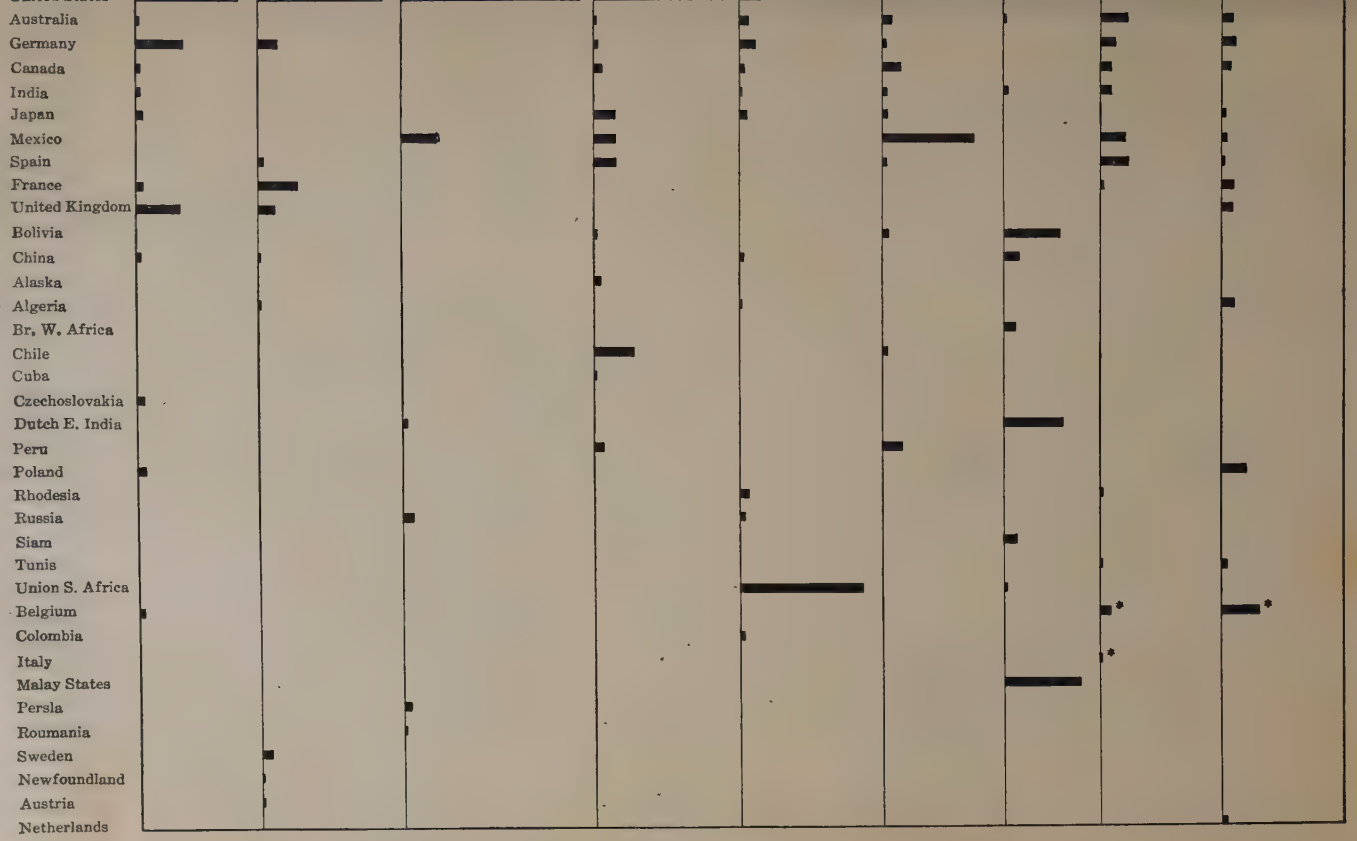


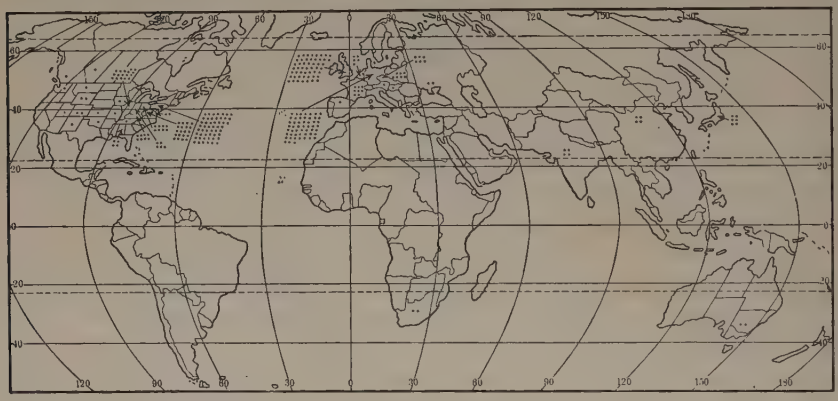
FIG. 103.—Production of Chief Minerals by Percentages, 1923.

All countries producing at least 1 per cent of any mineral are included.

* Smelter production. Imported ores are included and reach a high figure in some countries such as Belgium and Netherlands.

slowly metallic ores and mineral fuels are formed, and of how limited are the regions where they occur, ought to make the world extremely careful in using them. It emphasizes the growing importance of control of the few areas where the various mineral products can be obtained in large quantities.

Distribution of the Chief Mineral Production.—One of the most noteworthy features of the production of minerals is the extreme concentration in a few countries. This is illustrated in Fig. 103, where the chief minerals are arranged from left to right in the order of the

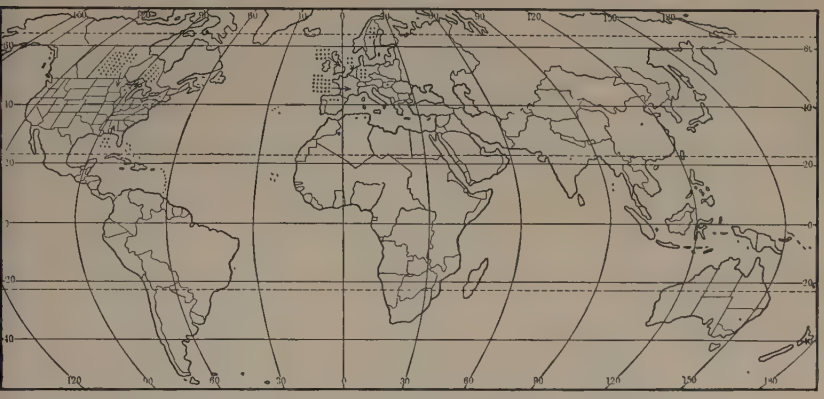


Denoyer'd Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 104.—World Map of Coal.
Each dot represents 5,000,000 tons.

value of their annual production. The countries are arranged vertically in an imperfect approximation to their general importance as mineral producers on the basis of both variety and quantity. All countries are included that produce as much as 1 per cent of the world's total production of any one of the minerals. Nevertheless, only thirty-six countries appear, and only twelve of these produce more than 1 per cent of three or more of the nine chief minerals. This in itself suggests how strongly the production of each mineral is concentrated in certain areas. The same thing is still more strongly suggested by the small proportion of bars which attain any great magnitude. Coal (Fig. 104), for instance, shows only three long bars —the United States, Germany, and the United Kingdom; iron ore (Fig. 105) shows four—the United States, France, the United Kingdom, and Germany including Luxemburg; petroleum (Fig. 106) boasts of only two main producers—the United States and Mexico, with Russia and Persia (Mesopotamia) some distance behind. Copper production on a large scale (Fig. 107) is not limited to quite so few countries as is

that of petroleum, but aside from the huge production of the United States, only Japan, Mexico, and Spain are conspicuous. With gold (Fig. 108) we come to the first great mineral whose production is most



Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 105.—World Map of Iron Ore.
Each dot represents 1,000,000 tons.

abundant in some country (South Africa) other than the United States, but the United States comes second, with Canada third, and then Australia, Rhodesia, and Mexico. Silver (Fig. 109) shows an unusual

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 106.—World Map of Petroleum Production, 1923.
Each dot represents 2,000,000 barrels.

feature in having two main producers of nearly equal importance, namely Mexico and the United States. Tin (Fig. 110) displays a still more unusual condition, for the Malay States, the Dutch East Indies,

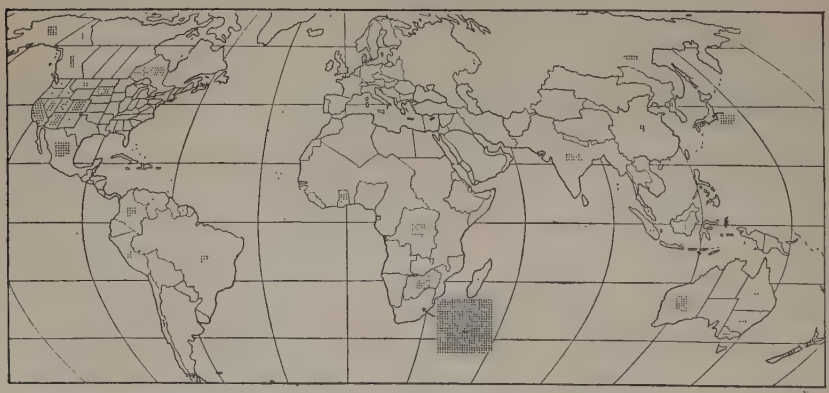
and Bolivia all produce about the same amount. With lead (Fig. 111) and zinc (Fig. 112) we return to a condition of overwhelming predomi-

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 107.—World Production of Copper, 1923.

Each dot represents 2000 tons.

nance on the part of the United States. Otherwise lead is distributed with unusual evenness, for Spain, Australia, Mexico, Germany, Canada, and Mexico each produce from 10 to 4 per cent. Zinc is still more



Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 108.—World Map of Gold Production, 1923.

Each dot represents 20,000 ounces.

widely produced, as would appear more clearly if statistics were available whereby the large amount smelted in Belgium—a non-producer of zinc ore—could be distributed to the actual countries of origin. Even as

Fig. 112 now stands, it is evident that Poland, Germany, Algeria, France, Australia, the United Kingdom, and Canada are all important sources of zinc.

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 109.—World Map of Silver Production, 1923.

Each dot represents 500,000 ounces.

The concentration of mineral production in a few countries and the overwhelming predominance of the United States are again evident in the following table showing the percentage of each of the minerals of

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 110.—World Map of Tin Production.

Each dot represents 500 tons.

Table 26 produced by each of the three chief producers in 1923. Pyrite and graphite, two very widely distributed minerals of relatively low value, are the only ones where the chief producer supplies less than 30

per cent of the world total. On the other hand, the United States produces over 50 per cent of the iron ore, petroleum, copper, gypsum, and sulphur; South Africa produces over 50 per cent of the gold, China of the

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 111.—World Map of Lead Production, 1923.
Each dot represents 2000 tons.

antimony and tungsten; Austria of the magnesite; and Colombia of the platinum. Taking the entire twenty-one minerals of this table, it appears that on an average the chief producing country furnishes over half of the

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 112.—World Map of Zinc Production, 1923.
Each dot represents 2000 tons.

world's supply, the second less than 20 per cent, and the third less than 10 per cent. Closely similar conditions prevail among the various companies in any given country; the bulk of the production comes

from a few huge companies typified by the Standard Oil, the United States Steel, the Anaconda Copper, and the British gold interests in South Africa. Still another phase of concentration is found in the fact that the big producers tend more and more to exercise financial control over the smaller. The copper of Chile, for example, the petroleum of Mexico, the tin of Bolivia and the Malay States, the gold of South Africa, and the silver of Mexico are all largely under the control of American and British capital.

PRODUCTION OF MINERALS IN THREE CHIEF PRODUCING COUNTRIES EXPRESSED IN PER CENT OF WORLD TOTAL

Based on Table 26 in Appendix

Chief Producer		Second Producer		Third Producer		Total of Three Chief Producers
Coal: United States.	42.1	Germany.....	19.6	United Kingdom.	18.4	80.1
Iron ore: U. S	51.5	France.....	17.4	United Kingdom...	8.2	77.1
Petroleum: U. S....	73.3	Mexico.....	14.9	Russia	3.8	92.0
Copper: U. S	53.9	Chile	16.8	Japan.....	4.5	75.2
Gold: S. Africa.....	51.8	United States.....	13.6	Canada.....	7.2	72.6
Silver: Mexico.....	38.0	United States.....	30.4	Peru.....	7.8	76.2
Tin: Malay States..	31.4	Dutch E. Indies...	24.5	Bolivia.....	23.6	79.5
Lead:* United States	43.7	Spain.....	10.5	Australia.....	10.3	64.5
Zinc:* United States	48.8	Poland.....	10.0	Algeria.....	5.1	63.9
Antimony: China...	70.7	France.....	10.9	Algeria.....	6.9	88.5
Bauxite: U. S.....	47.0	France.....	36.8	British Guiana....	9.6	93.4
Graphite: Germany.	23.9	Chosen.....	18.7	Madagascar.....	12.6	55.2
Gypsum: U. S.....	83.2	United Kingdom...	5.0	Australia.....	1.1	89.3
Magnesite: Austria.	71.6	Greece.....	9.7	United States.....	8.5	89.8
Manganese: India..	41.9	Brazil.....	29.6	Egypt.....	11.5	83.0
Phosphates: U. S...	47.6	Tunis.....	36.8	Algeria.....	8.6	93.0
Platinum: Colombia.	60.4	Russia.....	36.8	Canada.....	1.8	99.0
Pyrite: Italy.....	18.6	Spain.....	18.5	Germany.....	15.7	52.8
Salt: U. S.....	30.4	Germany.....	12.6	China.....	9.8	52.8
Sulphur: U. S.....	82.7	Italy.....	12.5	Japan.....	1.7	96.9
Tungsten: China...	54.0	India.....	18.0	United Kingdom..	8.4	80.4
Average.....	50.9		19.2		8.8	78.8

* Smelter production. Belgium omitted.

The chief reasons for concentration are, first, the activity and stage of progress of the nations concerned, and second, the richness and size of the deposits, and the consequent cost of production. When the modern era of machinery, transportation, and the development of mineral resources began, it was natural that the more advanced and thickly populated countries such as England and Germany should scour their hills for minerals. Hence in those countries practically everything of much value has probably been discovered and a great deal

has been mined. As transportation improved, the search for minerals became more widespread, and the richness and size of the deposits tended to become the factor which controlled development. It is cheaper for British capital to work rich or extensive tin deposits in the Malay States, for example, than to work poor or limited ones in England. Improvements in transportation give a further advantage to the good deposits. They tend to diminish freight charges as a factor in the ultimate cost.

Improvements in the technique of mineral extraction likewise tend to concentrate production in the areas of most abundant ore. Such improvements generally demand expensive machinery and large-scale production, so that they are rarely profitable except where extensive ore bodies make it possible to work on a large scale. In such places, they reduce the cost of the finished metals very appreciably, as do the other economies which accompany large-scale production. As a result, small mining propositions are constantly being abandoned because they cannot compete with large ones; or else they run when prices are high, but shut down as soon as the market becomes sluggish. We are fast approaching a point where the richest and largest bodies of ore, no matter what kind of countries they are in, tend to furnish the bulk of the world's supply. The thirty countries mentioned in the preceding table range all the way from the progressive United States to backward and isolated Bolivia, from white France to black Madagascar, or from cool Great Britain to hot British Guiana.

The Consumption of Minerals.—The consumption of mineral products, especially of the metals, has relatively little to do with the place where they are produced. It depends almost entirely upon the stage of progress, and especially the amount of manufacturing in a country. This is illustrated by Fig. 113, showing the way in which copper is transported from the mines to the eastern section of the United States. Practically the whole output of places like Arizona, Mexico, and even Chile goes to the manufacturing section of the northern United States between the North Atlantic Ocean and the Mississippi River, or to the similar European section around the North Sea. The same is true of practically every other metal and to a less degree of petroleum. With coal this is not so true, for the best coal, as we have seen, happens to be located in the regions where most of the other conditions are especially favorable to manufacturing. Nevertheless, in the United States the greatest movement of coal is like that of copper, namely from the mines to the manufacturing centers near the Atlantic Ocean and along the Great Lakes.

For the world as a whole, the areas where the main minerals are

consumed are summed up in Fig. 114. This does for the consumption of metals what Fig. 103 does for their production, except that gold is omitted because its use for money causes its consumption to follow special laws. Only the silver used in the arts is included. The lengths of the bars indicate the percentage of the world's total production consumed in each country. Only those countries are included that

From Spurr and Wormser: The Marketing of Minerals. Courtesy of J. E. Spurr.

FIG. 113.—Production and Movement of Copper in North America.

N. B.—To save space the map-maker has put the copper width at Tehuantepec instead of Panama.

consume at least 1 per cent of some one of the nine products here considered. The most significant feature of Fig. 114 is the comparative regularity with which the main countries occupy the same rank in the consumption of all kinds of minerals; first the United States, then Germany, Great Britain, and France. Great irregularities like those of Fig. 103 are conspicuously scarce. The chief examples are petroleum in the United States and silver in India. The latter country consumes huge amounts of silver for jewelry, which many of the people

use as a means of storing up their surplus wealth. Minor irregularities, such as a comparatively large consumption of petroleum in Russia, copper in Japan, and silver in Peru, show that local production does have some effect on consumption. Nevertheless, the outstanding fact disclosed by a comparison of Figs. 103 and 114 is that although the production of minerals is distributed over the world more or less haphazard, without well-defined geographical laws, their consumption follows the same laws which determine where civilization shall make rapid progress and where manufacturing shall be well developed.

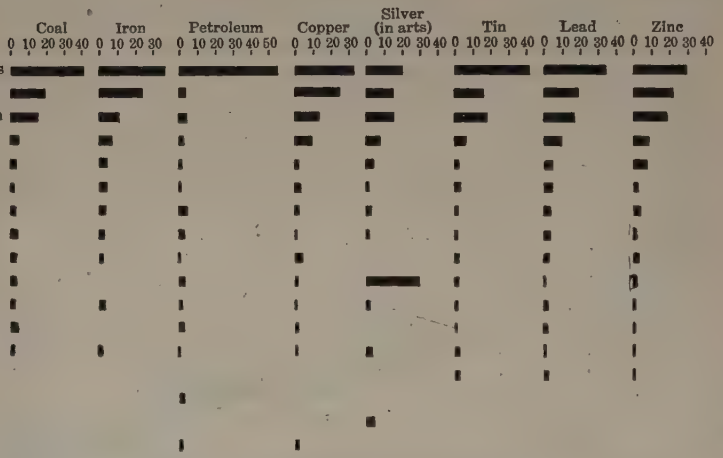


FIG. 114.—Consumption of Chief Minerals, Expressed in Percentages of World Total.

Includes countries consuming at least 1 per cent of world total are included. Based on unpublished pre-war data compiled for the United States Government under the direction of C. K. Leith, but modified to allow for recent changes. Data for Russia are doubtful. Poland should be included, but data are not available.

Where Minerals are Stored for Future Use.—After the metals and other minerals have come to the great manufacturing centers to be converted into machinery, tools, and other goods, where do they go? Are they again distributed over the world? Not to any great extent. The United States, for example, has now become one of the greatest exporters of machinery and other goods made largely of metals. Yet in 1919 the total exports of all kinds of metals and metal manufactures, from the ores up to finished automobiles and sewing machines, were worth only 8 per cent as much as the metal goods, machinery, and vehicles manufactured in the same year. In 1921 the corresponding figure was 10.2 per cent. If we omit ores and the pig metal which is exported just as it comes from the mines, the United States exports less than a tenth of all the goods which it produces out of its vast share

of the world's supply of metals. The rest remains in the country, as does the huge production of stone, cement, and the like. Most of these mineral products remain within a few hundred or at most a thousand miles of where they are manufactured. They are stored up in the manufacturing regions in the form of factories, machinery, vehicles, office buildings, and homes of workers whereby those regions become still greater producers. In the great European manufacturing center, the same thing takes place, although a somewhat larger proportion of the mineral products is probably exported in manufactured form. The manufacturing regions of the United States, Canada, Germany, Britain, France, and the neighboring small countries take to themselves not far from 90 per cent of all the more useful metals and minerals. They are willing to let the silver be stored up in India because it is of little use in making anything that leads to further production. But the iron, copper, lead, zinc, tin, and minor metals, as well as all the other rarer minerals, are not only greedily seized but carefully kept. If we make allowance for the large amounts of machinery, vehicles, and so forth shipped from one manufacturing country to another, it is probable that out of the 90 per cent more or less which forms their share the manufacturing people send to the rest of the world not much more than 5 per cent, if as much. Thus fully 85 per cent of all the world's mineral production is presumably consumed or stored in useful forms by one-fifth or one-sixth of the world's population who live in the manufacturing regions of North America and Europe. On a per capita basis, these people probably have thirty or forty times as much machinery and other means of production as have the average people of the rest of the world, hundreds of times as much as have the Chinese, and thousands of times as much as the inhabitants of Central Africa. Here, as in so many other cases, the contrast between the most favored and the least favored nations is steadily and rapidly increasing.

EXERCISES AND PROBLEMS

1. The relative mineral production of the countries of the world. From Table 26 prepare a list of minerals, and under each write (*a*) names of all countries producing at least one-tenth of each mineral, (*b*) amount of production in each country, and (*c*), total number of countries in which at least 1 per cent of the given mineral is produced.

Classify the minerals in two ways: (*A*) according to whether one, two, three, or more countries produce as much as 10 per cent; (*B*) according to the number of countries in which at least 1 per cent of the world's total supply is produced. Draw conclusions as to which minerals are the most widespread, which are most likely to cause international complications.

FIG. 115.—Coal Fields, Oil Fields, and Pipe Lines in the United States.

2. From the first list prepared in Exercise 1, prepare another showing for each country the names of the minerals produced there in excess of 10 per cent of the world total. Rearrange this list by continents, putting the countries of each continent in order according to the number of minerals produced to the extent of 10 per cent. On a map of the world insert the names of the minerals in all countries where they are produced to the extent of 10 per cent. Make a list of all countries having a population of ten million or more (Table 1) and not appearing on your list. Draw conclusions as to the parts of the world where mineral wealth is most and least developed, and the causes of the difference. How far do you believe that the countries where much mineral wealth is produced are also the parts whose mineral resources are greatest?

3. Repeat Exercise 1, using states and provinces instead of countries (Table 27).

4. Repeat Exercise 2, using states instead of countries (Table 27). What incentive, which impels countries to develop their own minerals rather than those of other regions, is lacking in the case of states? Why? Is this advantageous or harmful?

5. From Table 28, select the five states leading in mineral industries. What figures in the table determine your decision? What physical characteristics have the five states in common? In what geographical conditions do they differ? What minerals plus what other conditions cause these states to rank so high in the mineral industries? In the selected states what are the other chief occupations and how do they compare in importance with one another and with mining (Table 8)? How far are they the states where mining is relatively the most important occupation?

6. Construct a "Gold" map of the world. Place upon the map in graphic form all the information about gold in the tables at the back of the book. Compare various ways of presenting data of this kind and make the pictorial story as effective as possible. (See Figs. 108 and 113.)

7. Repeat Exercise 6, using some other mineral. Look up the mineral in reference books and write an account of its geographical distribution and its effect on industry and commerce. (Figs. 104 to 112.)

8. From the Statistical Abstract of the United States or the Mineral Resources of the United States draw curves showing the production of petroleum in the U. S. during as long a period as possible. Draw similar curves for Pennsylvania, West Virginia, Ohio, Kentucky, Illinois, Oklahoma, Kansas, Texas, and California. Study the curves and formulate some theory concerning the life of an oil well or an oil district. What predictions are possible concerning those districts whose curves are still rising?

9. In Table 26 arrange the countries of the world in three groups: (*A*) producing both iron and coal; (*B*) producing one but not the other; and (*C*) producing neither. Study the groups and try to determine how the progress of the various countries has been affected by their position in these groups.

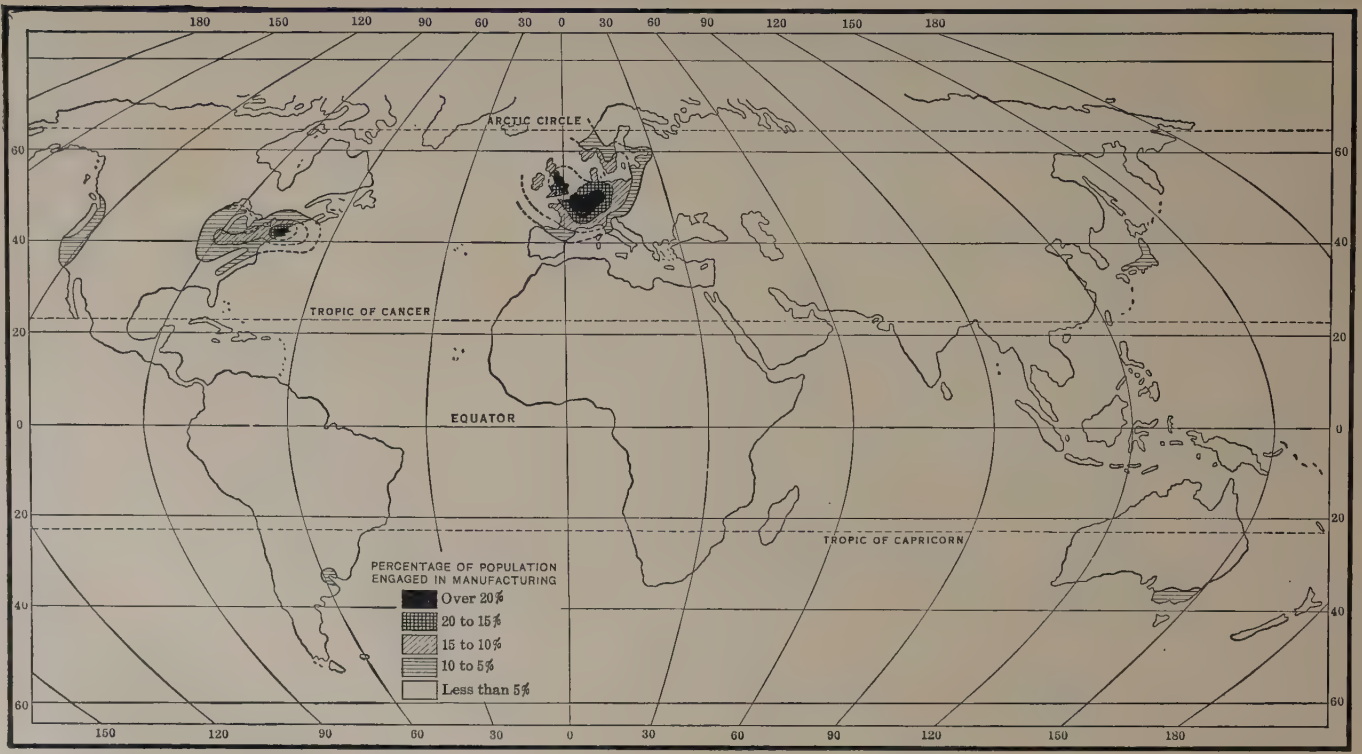
10. Write out directions for an exercise that will bring out the geographical significance of Fig. 115. Follow the similar directions prepared by some other member of the class.

CHAPTER XXI

CHARACTER OF MANUFACTURING COMMUNITIES

The Three Stages of Manufacturing.—The general distribution of modern manufacturing has already been discussed in connection with climate, transportation, and metals. We have seen that such manufacturing is largely limited to a few areas of stimulating climate inhabited by the more progressive races (Fig. 116). It must be remembered, however, that the making of a bow and arrow is as much a manufacturing operation as is the making of an airplane. When viewed in this broad way, manufacturing may be divided into three main types or stages: (1) *primitive* manufacturing, illustrated by an Indian of Guatemala who carves a handle for his big machete and then uses the completed tool to fashion a bowl from a gourd; (2) *simple* manufacturing, where local raw materials are converted into forms that can be conveniently shipped or kept without injury, as in the milling of wheat, the shaping of lumber, cotton ginning, ore smelting, and the preparation of raw sugar; and (3) *complex* manufacturing, in which the location of raw materials makes relatively little difference, since the value of the final product depends mainly upon the amount of labor, as in the making of locomotives, dyes, fine cloth, and high-grade chemicals.

The three stages are well illustrated by shoemaking. Suppose a Mexican herdsman kills a steer and tans the hide at home. Then with no tools except a knife, awl, and needle he shapes the leather into a rough pair of soft-soled shoes. That is primitive manufacturing. But suppose the hide of a steer is shipped along with many others to a local tannery. It is there treated according to the methods of simple manufacturing. First it is softened in lime pits. This makes it ready for a machine which scrapes off the hair, the epidermis, and the fleshy inner part of the skin. Then the lime is removed with acid, and the hide is washed and then tanned, passing gradually from pits containing weak solutions to those where the solution is strong. After weeks or months in the pits the hides are cleansed, bleached, scoured, and oiled or greased. The whole process of tanning takes from three months with poor leather to eight or ten with the highest grades. The tannery is a good example of simple manufacturing for two reasons: First,


180 150 120 90 60 30 0 30 60 90 120 150 180
ARCTIC CIRCLE
TROPIC OF CANCER
EQUATOR
TROPIC OF CAPRICORN
60 40 20 0 20 40 60
PERCENTAGE OF POPULATION ENGAGED IN MANUFACTURING
Over 20%
20 to 15%
15 to 10%
10 to 5%
Less than 5%

Denoyer's Semi-elliptical Projection.

FIG. 116.—The Distribution of Manufacturing.

although it employs machinery and puts the goods through a number of processes, the final product is not very different from the original raw material. Second, the tanning industry depends largely on local raw materials or else is located where raw hides can reach it at relatively slight expense.

Let us carry the hides to a shoe factory and see what happens to them in a complex industry. Here the workmen are largely specialists. The ordinary shoe consists of eight or ten pieces of leather in addition to the lining, eyelets, lacings, nails, pegs, and perhaps certain parts made of cotton cloth, felt, paper, or rubber. Each part is made by a different workman using a different type of machine. Then the parts go to another set of operatives and are put together with the help of special sewing machines of various kinds according to the parts that are to be united. Other machines drive nails, insert the eyelets, smooth and polish the soles and heels, and perform the other finishing operations. When the shoe is ready it not only is wholly different from the original hide in appearance, but it contains materials derived from many different sources. Moreover, a large part of its value is due to the work that has been put into it rather than to the raw materials.

Primitive Manufacturing.—Primitive manufacturing is almost the only kind in many tropical regions including a large part of Africa and South America, except where the white man has introduced something else. It also is the chief kind of manufacturing throughout the greater part of the continent of Asia.

In some form primitive manufacturing prevails almost everywhere. This is an advantage, for although it is bad for a country to have no other form of manufacturing, it is a detriment if household industries, which are an outgrowth of the primitive type, are not highly developed. Where people have considerable native ability their primitive manufactures often possess a high esthetic quality as in the wood carving and toys of the Swiss, the lace of Italy and Ireland, the shawls of Kashmir, the quilts of the Kentucky mountains, and the rugs of Turkey and Persia. Such articles, which often preserve old and attractive designs, are the only primitive manufactures which play any appreciable part in the general business of the world. Their persistent manufacture is generally due to the fact that they depend on some hand process which no machine can yet imitate satisfactorily. Otherwise, except in regions where transportation is unusually difficult as in Tibet, or where the people are so few and poor that it is not worth while to import manufactured goods from a distance, as among the Eskimos, the products of primitive manufacturing are being rapidly superseded by cheap substitutes manufactured in more progressive countries. For

instance, the cheap cotton cloth in which the majority of people in China, India, and Africa are clothed is largely produced by English mills.

Turkish rugs are a good example of a primitive manufacturing industry which still thrives. The raw materials are produced close at hand, the wool coming from the flocks of the nomads and the dyes from plants which usually grow locally. Sometimes a good vegetable dye requires ten or twelve processes lasting nearly a year. The fact that aniline dyes are now being used illustrates how an artistic primitive industry tends to break down and deteriorate under the competition of manufactured goods from more progressive countries. In making a Turkish rug no machinery, beyond what almost anyone can construct, is needed. The warp threads are merely stretched parallel to one another so that they can be wound up on a round beam, the woof threads are then passed through the warp, a knot is tied, and the thread cut. The work is extremely slow, for a clever girl, working eight hours a day and tying three knots a minute, would need about four years to make a rug seven by four feet with twenty knots per inch. But such a rug involves no heavy outlay of capital and so no financial problem. It commonly is used by its maker and hence involves no marketing problem.

If the rug gets into the current of the world's business, it is almost invariably because progressive people from other countries come to the place where it is made and insist on buying. Often the maker has no desire to sell, or else sells merely from the compulsion of poverty. In this fact lies one of the chief differences between primitive and complex manufacturing. The people who carry on complex manufacturing not only make goods to sell, but go out and create a market for them among people of every degree of progress. They likewise almost compel less active people to prepare the raw materials which they require. In other words, the push and energy which stimulate manufacturing come largely from a few progressive regions. For instance, the rug industry has been much stimulated in Persia and Turkey by American buyers; the primitive home cotton industry of India has risen to the status of a simple factory industry under the influence of Englishmen. Even in our own southern states, the cotton factories of the Carolinas and Georgia and the iron factories of Alabama are largely owned and run by northerners.

Simple Manufacturing.—The second stage of manufacturing is located in places where the people have more push and inventiveness than do those who are content with primitive manufacturing, or else where other races bring in the necessary initiative. Moreover, simple manufacturing prevails in regions where people have more of a given

raw material than they need, and where they can sell it more profitably if they change its form before sending it out. For example, the presence of a specially abrasive sandstone called Berea grit enables northern Ohio to make 70 per cent of all the grindstones in the United States. In many cases such simple manufacturing is an incidental industry. For example, the canning industry arose largely because many raisers of fruit and vegetables had a surplus which they could not sell locally and which was being wasted. Part of this the farmers' wives began to can or dry for their own use; then they sold their garden and orchard products to neighbors in the villages who had taken up the work of canning, and finally to factories which were ultimately established in the locality. Now that canning is well established as a profitable industry, the process is generally reversed. A factory is started, and the farmers are thus stimulated to raise the necessary vegetables and fruit. In the beginning the canning industries paid little attention to climatic optima and good soils, for people manufactured only what surplus they happened to have, but as the business proved profitable they worked to create a surplus. Then the places where the climate and soil are most favorable took the lead, for there the surplus is largest and it is easy to create a still larger surplus. Hence, the region around Baltimore has come to be a leader in canning tomatoes, southern Maine for sweet corn, California for peaches, Hawaii for pineapples, and the Columbia River and Alaska for salmon. Usually a simple industry grows until it exhausts its supply of local raw materials. If it is situated in a region where the people are especially energetic and ingenious, it tries to get materials from a wider area and may become complex. For example, the brass and bronze industry of Connecticut began with the use of copper kettles discarded in colonial kitchens a century or two ago, but it gradually grew until it became a highly complex industry bringing copper and tin from long distances and manufacturing over 40 per cent of the brass and bronze of the United States.

Summary of Simple Manufacturing.—Taken as a whole, the simple industries may be thus summarized: They use few raw materials, most of which are of local origin and have not passed through a previous process of manufacturing. These raw materials are usually manufactured near the source of production because they are either bulky or perishable in the raw state. If they are perishable, the industry may be highly seasonal, demanding many workers at one time, for example, at the harvest season, and few at others. Such temporary employment plus the absence of complex machinery encourages unskilled labor. This tends to retard regions of simple manufacturing, for it restricts the growth of any large body of skilled workers, who are usually more

eager than the unskilled workers to advance the interests of the community.

The reduction of bulky raw materials to the manufactured condition usually gives rise to waste products. A flour mill produces bran, a corn canning factory has husks and cobs which were formerly wasted or fed to the pigs but are now beginning to be used for alcohol and other purposes, and a blast furnace produces much slag which is a source of excellent fertilizer. Where attention is paid to these, the profits of simple manufacturing are often materially increased. For this reason more and more use is being made of such articles as sawdust, slab wood, and fish bones. In a large slaughter house every bit of fat is tried out from the scraps of edible meat that cling to the bones. The inedible parts and the bones that are not wanted for buttons or glue were formerly made into fertilizer but now are completely disintegrated in superheated steam and made into cakes that are very fattening for cattle. The utilization of by-products is one of the chief ways in which simple industries gradually become complex.

In general, the scale of production in typical simple industries is relatively small and the financing requires only sums that can be raised locally. Sometimes, however, the scale of production is enormous as in the great meat-packing establishments and the petroleum industry, but in both these cases the use of by-products is so extensive that the industries are really complex. The selling problem is also relatively simple, for aside from the foodstuffs the products of simple manufacturing rarely go to the ultimate consumer, that is, to the individuals or businesses where they are finally worn out or destroyed. Instead they usually go to other lines of business where they are changed into new forms, as when wood is used in houses, iron in making machinery, and linseed oil in making paint. Under such circumstances the market conditions in simple manufacturing depend largely on the people from regions of complex industries who go out to buy half-manufactured raw materials. This is a disadvantage to the communities where simple industries prevail because it prevents the local communities from attracting to themselves the wideawake type of people who naturally take up the complicated problems of salesmanship.

How the Complexity of the Highest Type of Manufacturing Limits its Geographical Distribution.—*A. Materials and Equipment.*—In the rest of this chapter our aim will be to examine some of the conditions which make the highest type of manufacturing so complex that it has thus far succeeded only in a few limited regions among people of unusual alertness and capacity (Fig. 116). One of the most prominent characteristics of complex manufacturing is the great number of materials

required. For example, compare the number of raw materials used by a shoe manufacturer with those used by the cattleman who raises the hides which form the manufacturer's chief raw material. The cattleman may need some corn from a distance in addition to what he raises himself. He also needs salt and tar, but only in small quantities. The equipment of saddles, agricultural implements, branding irons, and so forth, which must be purchased from a distance, is relatively small. So is the supply of clothing for the family and that part of the food which is not raised locally. The cattleman's few buildings are simple in construction and are made almost entirely of whatever kind of wood can be procured most cheaply. On the other hand, the shoe manufacturer may require not only leather, but many products of simple manufacturing, including cotton thread from the South, maple lasts from New England, nails and eyelets from iron foundries in Pennsylvania, linen thread grown perhaps in Russia and manufactured in England, wax from palm trees on the edge of the Sahara desert, and even oil extracted from bananas raised within the tropics. His buildings take the form of an extensive plant of brick, glass, cement, steel, and wood. His tools in large part are highly complicated machines, some fitted with saws having teeth of English steel, others competent to measure a hide and show on an indicator just how many square feet it contains. In addition to all this, a shoe manufacturing community must depend on other people not only for clothing and shelter, but also for its food, except perhaps a few vegetables.

B. Limitation of Manufacturing by Transportation.—Few other occupations demand such extensive transportation and employ such diverse methods as does complex manufacturing. In order to make the numerous and complicated exchanges which finally enable the manufacturer to get raw materials in place of his finished products, the component parts of a single article may make a score or a hundred journeys by almost every mode of conveyance. Call to mind the steamships, railways, camels, auto trucks, and other means of transportation used in bringing the raw materials mentioned in connection with shoemaking. Among primary producers, the dairyman and market gardener perhaps depend more immediately than the manufacturer upon steady local transportation, especially at certain seasons, but their products usually move relatively short distances and make only a few trips. Complex manufacturing in regions of poor transportation is so hampered as to be almost impossible.

C. Limitation of Manufacturing by the Labor Supply.—Complex manufacturing is likewise almost out of the question in places where the labor supply is poor. This is partly because of the number of people

employed. In the United States the number of wage earners reported as engaged in complex manufacturing in 1914 was about 4,775,000 compared with 1,865,000 in simple manufacturing and 2,664,000 employed on farms other than those of their own families. Still more important is the fact that only about 3 per cent of the persons engaged in manufacturing are in any sense owners and only another 11 per cent belong to the office force, whereas about 50 per cent of the persons engaged in agriculture either own their farms or at least rent them and are their own managers, and another 27 per cent belong to the families of the farmers. Although the farmer is confronted by a grave labor problem because of the seasonal character of his occupation, he and his family usually do so large a share of the farm work that the failure of the outside labor supply does not ruin him, unless his farm is large. The manufacturer must hire all his labor, and unless he is located where the labor supply is quite large he cannot keep steadily at work or avoid ruinous strikes and other labor troubles.

Another way in which the labor supply limits the areas where complex manufacturing can be carried on successfully is due to the complexity of the work. Where the cattle raiser, for example, requires only a few men who can easily be trained, the shoe manufacturer requires many kinds of operatives, some of whom need long training. Of course it is easy to get untrained girls who can care for "crippled" shoes, but it is hard to find men so skilled that with the naked eye they can judge the shape of heels held against rapidly revolving knives. These men make high wages even though they are fined if the fraction of a moment's delay gouges a heel too deep and ruins its shape. So varied and large a supply of labor can be procured only in regions with a fairly dense population, so that the higher types of manufacturing do not thrive except where the population is dense.

The labor conditions also cause manufacturing regions to be centers of a grave series of social problems such as unemployment, poor relief, strikes, socialism, and child labor. Where the work is so specialized the failure of any one group may throw the whole factory out of work. Moreover, one industry depends so closely on another that a strike or a shutdown in the steel works, for instance, may hold up the automobile makers, the railway repairers, the makers of cotton machinery, and many other workers. Again, factory work is so mechanical, so minutely subdivided, and demands so little initiative that it is monotonous and disagreeable. Moreover, while the owners of a factory are frequently at the mercy of the operatives, the operatives are also at the mercy either of the owners or of the unions. Such conditions breed discontent. The density of the population makes it easy for

agitators to make themselves heard, so that discontent spreads and there is constant social ferment. Permanent success in complex manufacturing demands that the community shall have enough organizing ability and determination to face and solve a vast series of such problems which show no tendency to become simpler, but rather to become more complex. Only a few parts of the world have yet shown this ability.

D. Geographical Limitations Due to the Financial Problems of Manufacturing.—Another condition which has an important bearing on the location of manufacturing industries is the large amount of capital required and the difficulty of making wise purchases of distant raw materials and extensive sales of the finished product. In the United States the capital invested in manufacturing in 1919 amounted to 44 billion dollars. This sum, large as it is, is scarcely half the value of all farm property including land, buildings, implements, machinery, and livestock. Nevertheless, it represents a far greater financial problem, for the farm values are largely the result of gradual growth; while the capital invested in manufacturing has in most cases been deliberately set aside as the result of savings, and has been invested in relatively large blocks at a single time. Hence, manufacturing can prosper only when it can draw on a large surplus of savings. The people who have the ability and determination to lay up much capital are limited to a few areas, chiefly in Europe and the United States. This is illustrated in Fig. 117 showing the per capita deposits in savings banks for all the states of the United States and for all the important foreign countries for which data are available. Of course savings banks are only one of several effective ways of putting aside money. But where such banks are numerous and well patronized, other forms of saving are almost sure to be practiced also. In Fig. 117 notice that the English-speaking and Scandinavian countries, together with Switzerland and the Netherlands, are the only ones where the deposits average above $25 per capita, and where really large supplies of capital are available. Countries like Tunis and Hungary have less than a dollar per capita in savings banks and India only 25 cents. It does not help India much to keep its small savings largely in the form of jewelry, for jewelry cannot be used as a means of further production.

For the United States, a better idea of the distribution of the capital available for manufacturing enterprises is given by the combined deposits in savings banks and national banks, as shown in Fig. 118. There the range is from $591 in New York and $580 in Massachusetts to only $39 in Georgia and $42 in South Carolina. Obviously the great financial center of the country is almost identical with the area

of most intensive manufacturing. There in the states of New York, Massachusetts, and Connecticut about 17 million people have an average of over $500 apiece in some sort of bank all the time. This, with the deposits in Pennsylvania and New Jersey, represents half the bank deposits in the United States. Another area of large deposits per capita is found in California, but the number of people is not a quarter as great as in the eastern center. It is interesting to note, however, that in spite of poor supplies of fuel and insufficient labor,

FIG. 117.—Per Capita Savings Bank Deposits in Foreign Countries and the United States, 1920 to 1923.

the manufacturing industries of the Pacific Coast are growing with great rapidity and are tending toward the highly diverse and specialized type of New England and the Middle Atlantic States. The same is true of the other countries which stand high in Fig. 117.

Of course the presence of capital in any given region is a result, as well as a cause, of manufacturing. When a manufacturing enterprise makes money there is a strong tendency to use it in the same region for further manufacturing or commercial enterprises. Many people, to be sure, invest heavily in remote lands, but a much larger number prefer to invest in promising enterprises that are directly under their eyes,

and in the management of which they may have a share. One good reason for this is that each new enterprise generally increases the value of other businesses and property in the surrounding region.

In proportion to the capital, the expenditures in manufacturing are far greater than in agriculture, for all the labor must be hired and all raw materials purchased. In 1923 the manufacturing establishments of the United States paid the huge sum of $11,009,000,000 for wages and salaries, $34,706,000,000 for materials and fuel and $2,660,000,000 for interest on invested capital if we reckon at 6 per cent. The expenditure of nearly 50 billion dollars is a tremendous force in stimulating the

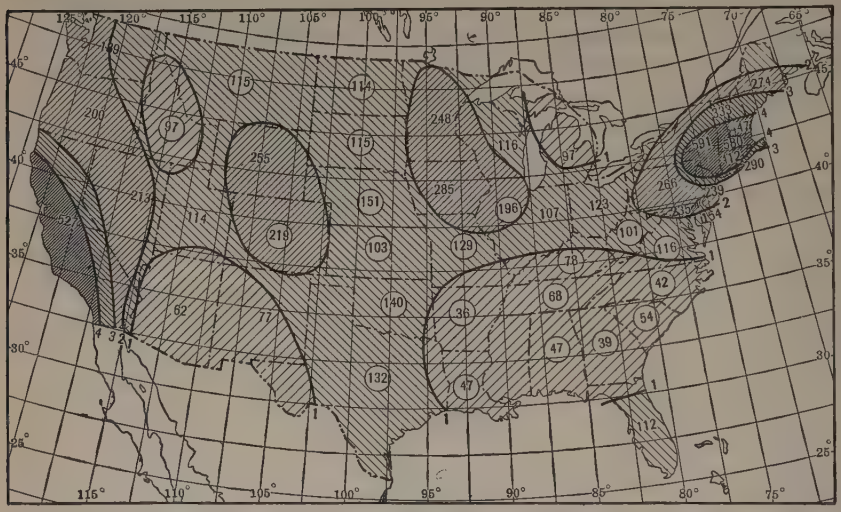


FIG. 118.—Per Capita Deposits in National Banks and Savings Banks, Sept., 1923.

The figures in each state represent dollars per capita. Where the figures are enclosed in circles there are no savings banks.

regions where it is spent. It increases the population and the savings, and it requires all sorts of other business enterprises to take care of the manufacturing population. Moreover, the spending of such vast sums also causes the highly developed manufacturing regions to attract capable men from other regions where the industries are simpler. All this, together with the advantages of having investments near home, tends strongly to stimulate new manufacturing enterprises. Thus the mere fact that industries are already established and are making money gives the shaded regions in Fig. 116 a tremendous advantage when it comes to establishing new factories. With manufacturing, as with mining, the modern tendency seems to be toward concentration in the most favorable location.

E. The Marketing Problem of Complex Manufacturing.—The greater the complexity of a manufactured article the more limited in general are the areas where it can be sold. Highly complex articles like adding machines, textile machinery, and locomotives are purchased only by a limited group of people, the great majority of whom are concentrated in the cities of the more progressive parts of the world. In this they differ markedly from such universally used and only slightly manufactured articles as flour, coal, wood, and other staple commodities. If these commodities are not offered for sale, people are promptly compelled to search for them. Hence the problem of marketing them is relatively easy and they can be profitably produced almost anywhere if there is a reasonable number of people and if the natural conditions are favorable. The sale of the complex articles, on the other hand, presents a difficult problem. A new law may render a given type of automobile almost worthless; a new fashion may necessitate the sale of a large lot of dresses at a merely nominal price; or a new invention may make certain kinds of cotton machinery worth no more than scrap iron. Closely connected with this is the other side of the problem, namely, the buying of raw materials. It is a relatively simple matter to buy wheat for a flour mill; it is extremely difficult to purchase the hundreds of materials needed in making an automobile. The result is that the more complex types of manufacturing tend strongly to be located not only near the main markets, but where they can obtain the best type of salesmen and of purchasing agents. The best place for all these purposes is the large manufacturing cities where many industries are already established.

F. Inventiveness as a Factor in the Distribution of Manufacturing.—Even the simplest kinds of manufacturing demand a considerable degree of inventiveness. As industries become more complex and competition keener, the necessity for ingenuity and inventiveness becomes greater. At the same time the possible rewards of a new invention increase, for the extent to which a new product can be marketed increases steadily with the degree to which people become accustomed to innovations. This is in harmony with the extraordinary way in which the number of patents issued by the United States Patent Office has increased. According to the following table, the rate is about two and a half times as fast as that of the increase in population:

PATENTS ISSUED ANNUALLY IN THE UNITED STATES

1860	4,778	1900	26,499
1870	13,333	1910	35,930
1880	13,947	1920	39,882
1890	26,292		

These figures illustrate the highly important fact that continued success in the higher types of manufacturing demands a constant stream of new inventions. The leading place is bound to go to those regions where the people have the ability, energy, leisure, and capital to make and apply the greatest number of successful inventions. Take a city like Waterbury, Connecticut, for example. That one city with almost no natural resources, with far less water power than it needs, and little except rugged hills for farmland round about it, has been the home of hundreds of inventions. One of the machines credited to Waterbury makes hair springs so small and delicate that a pound is worth nearly $50,000. Another machine carries on 141 operations automatically, and still another turns out screws so tiny that thousands are needed to fill a thimble.

The Geographic Conditions of Manufacturing.—From the foregoing discussion it is evident that while simple forms of manufacturing are possible wherever man lives, the evolution of manufacturing puts stricter and stricter limits on the regions where the highest types can be practiced. When wool and cotton thread were spun only by hand, and when the products were woven into cloth by the simple process of passing the woof threads back and forth across the warp by hand, the quality of the cloth made in the various parts of the world was almost the same. To-day, when the finest cloths demand extremely complex machinery and great skill in organizing and financing the industry, the higher grades of textiles are manufactured only in a very limited area, chiefly in the northeastern United States, Great Britain, and a small part of continental Europe including Belgium, northern France, part of Germany, and Switzerland, together with a few neighboring regions such as Sweden and southeastern Canada, and one or two other areas, including the Pacific Coast of the United States, Japan, Australia, and New Zealand. In the same way, although pig iron and the coarser steel products are being manufactured more widely now than ever before, the making of high grades of steel goods, such as complex machines, is strictly limited to the areas just mentioned. The most notable fact is that the complex type of manufacturing flourishes only (1) where natural selection and migration have given the inhabitants a racial inheritance of high mental activity and capacity; (2) where the climate is so healthful and stimulating that people possess great energy and perseverance; (3) where a certain degree of skill has been acquired and each generation is able to teach its successor, and (4) where abundant capital is available.

EXERCISES AND PROBLEMS

1. Study the relation of large cities in the United States to manufacturing. From Table 8 E pick out the 10 states with the largest percentage of the population engaged in manufacturing and the 10 with the smallest. In Table 6 count the number of cities of over 100,000 population located in each of these groups of states and in all the rest of the states. How many of the 10 highest states in Table 8 E are also among the first 10 in Table 2 E? What do you conclude as to the relation between manufacturing and the size and number of cities?

2. Study the racial composition of the manufacturing communities of the U. S. From Table 2 G, H, and I, and all columns of Table 3. Let different members of the class prepare averages showing the percentage of persons of each race in the 10 states which have the largest percentage of the population engaged in manufacturing (see Exercise 1). Compare the averages with the corresponding averages in (*A*) the 10 states where colored people are most numerous, and (*B*) the 10 states from Iowa and Minnesota westward to the Pacific. What do you conclude as to the races employed in the unskilled labor of manufacturing regions?

3. Study the three stages of manufacturing in some industry other than shoemaking. Choose an industry from your own town. From books of reference and from observation prepare an account of the characteristics of the community and the kinds of manufacturing processes in a typical community where the material of your industry is subjected to each of the three stages of manufacturing. Describe in detail the manufacturing processes in each case. Give the geographical and economic reasons for the distribution of the three stages of manufacturing.

4. Explain why complex selling systems are an almost inevitable result of complex manufacturing and why they penetrate into the regions of simple and primitive manufacturing.

5. Study one of the following simple industries in its relation to by-products: (*A*) Manufacture of kerosene, (*B*) slaughtering, (*C*) manufacture of gas, (*D*) saw mills, (*E*) cotton ginning. Use encyclopedias and census tables and determine the relative importance of the by-products and the original product, both in value and in number of persons employed.

6. Explain the political relations between manufacturing and (*A*) immigration. (*B*) tariff, and (*C*) ship subsidies. Explain why the attitude of manufacturing communities on these subjects is likely to be different from that of agricultural communities. From the tables in the *World Almanac* determine the percentage of votes cast for a presidential candidate standing for a high tariff compared with the votes for his low tariff opponent at any election where the tariff issue was of chief importance, and make an isopleth map. Or find the individual votes of the Representatives at Washington on some recent bills and determine what percentage of the representatives of each state voted for restricted immigration, a high tariff, or ship subsidies, and make an isopleth map. What relation can you see between your map and the dominant industries in various parts of the country?

7. Compare the map of manufacturing (Fig. 116) with that of climatic energy (Fig. 47). From what is said in this chapter about the effect of climate on manufacturing and from your own knowledge explain the resemblances and especially the differences of the two maps. What non-climatic factors, geographical and otherwise, are especially important in determining the regions where the most manufacturing is done?

8. Suppose that three men are of exactly equal ability. One lives in the rugged part of Kentucky where transportation is so difficult that people often fashion their own tools; the second in a small town in North Carolina where he works in a cotton mill; and the third works in a watch factory in a Connecticut brass town. As the result of occupation alone what are the chances of mental development in each case? How far and in what way would mental development in each case be influenced by factors outside the man's immediate job, but depending on the degree of development of manufacturing?

CHAPTER XXII

COMMERCIAL CENTERS AND THE DISTRIBUTION OF CITIES

Factors in the Geographical Distribution of Cities.—In attempting to gain a clear idea of the distribution of the great cities which are so essential not only in commerce and industry, but in practically every aspect of civilization, let us limit ourselves to the cities of over 200,000 inhabitants given in Tables 4 and 5. Their distribution is represented in Fig. 119 where each dot represents a great city. If smaller cities were added the general features of the map would still remain un-

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 119.—World Map of Great Cities.

changed. The factors that control the distribution of cities may be divided into two classes: (*A*) those determining the degree to which city life prevails in various regions, and (*B*) those determining the exact location of individual cities. Omitting for the moment all human factors, it appears that the main physical factors of the first class are climate, the general relief of the land, the proximity of bodies of water, the general supply of mineral deposits, and the fertility of the soil. Those of the second class comprise especially the minor features of relief, harbors, water-power sites, and the specific location of mineral

deposits. This second set produces its results directly by making some locations advantageous and others disadvantageous. The first set, however, acts for the most part indirectly through its effect on occupations, mode of life, density of population, stage of development, and type of civilization.

Climate and the Distribution of Cities.—So far as the growth of cities is concerned, the effect of climate upon human energy is even more important than its effect upon the supply of food and raw materials. Cities, as we shall see, are primarily a response to human energy and productivity. Accordingly let us compare Fig. 47, showing climatic energy, with Fig. 119 showing the distribution of great cities. A resemblance is at once obvious. The regions of stimulating climate are thickly dotted with big cities; those with medium climates have a fair number; and those with enervating climates, very few. This relationship is expressed numerically in the following table:

Type of Climatic Energy	Approximate Population A	Number of Great Cities B	Average Size of Great Cities C	Approximate Percentage of Population in Great Cities D
Very stimulating..	333,000,000	98	602,000	17.9
Stimulating.....	290,000,000	27	648,000	6.0
Medium.....	500,000,000	33	692,000	4.6
Enervating.....	180,000,000	12	565,000	3.8
Very enervating..	500,000,000	20	379,000	1.5

The significant fact here is the regularity and rapidity with which the figures in column D tend to diminish from very stimulating to very enervating climates. Although the regions of very stimulating climate comprise only about 10 per cent of the earth's surface and contain less than a fifth of the people, they contain over half of the great cities. The percentage of their population (column D) in great cities is twelve times as large as the corresponding percentage in regions of enervating climate. Moreover, where the climate is very enervating the main growth of the cities is due largely to the temporary presence of people from more stimulating regions, as at Bombay, Batavia, Singapore, Colombo, and Bahia.

It is important to know not only the general relation of cities to climate, but their exact relation to specific conditions of rainfall and temperature. In Fig. 120 the world's cities of over 200,000 population are divided into groups according to rainfall. The height of the irregular

line shows the total population in all cities of each group. Large cities are almost absent in areas having less than 15 inches of rain, and are rare in those with 15 to 20 inches. As the rainfall approaches 25 inches the cities increase enormously both in number and size. This group includes cities like San Francisco, Constantinople, and Adelaide, where the rain comes mainly in winter; like Mexico City, Lahore, and Peking, where it comes in summer; and many like London, Paris, Berlin, and Moscow, in fairly cool regions where a moderate rainfall at all seasons is sufficient. Regions with from 25 to 45 inches also contain many cities, but where the rainfall rises higher, large cities do not thrive.

The mean temperature for the year (Fig. 121) seems to be even more important than the rainfall in its relation to the location of great cities. Where the mean annual temperature (average of warmest and

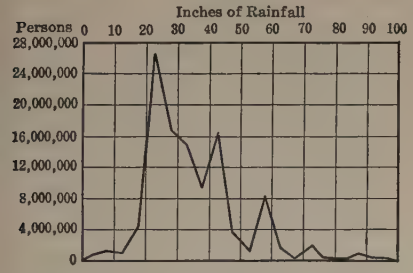


FIG. 120.— Population of Great Cities Distributed According to Rainfall.

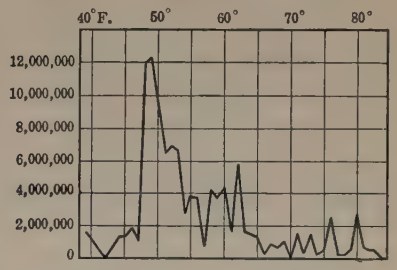


FIG. 121.—Mean Temperature and Number of Persons Living in Cities of Over 200,000 People.

coldest months) is less than 38° there are no large cities. Where it is less than 48° there are very few. But over half (52 per cent) of the 113,000,000 people who live in cities of more than 200,000 population are concentrated in cities having a mean annual temperature ranging from 48° to 53° F. At higher temperatures, up to an annual average of 62°, cities are fairly numerous, but above that they are rare. The 76 cities having mean temperatures from 48° to 53° average much larger (771,000) than do the 19 cooler cities (505,000), or the 93 warmer ones (489,000).

The summer and winter temperatures of regions where great cities are located are illustrated in Fig. 122. The largest cities tend to be located where the coldest month averages 32° and the warmest 67°. Such temperatures, with an annual rainfall of about 25 inches and with plenty of storms at all seasons so that the rainfall is distributed quite evenly throughout the year, appear to furnish the most favorable climate for the development of great cities. This differs only a little

from the ideal climate as determined in other ways in previous chapters. Berlin approaches this type more nearly than does any other great city, just as London comes nearest to the ideal as determined by the more exact methods described in a previous chapter.

Relief and the General Distribution of Cities.—The relation of relief to the location of cities is much simpler than that of climate. The overwhelming majority of the world's large cities are located on level plains, as in the case of Chicago, Berlin, and Peking, or at least in regions of gentle relief, as at New York and Paris. A city built on really steep hills, like those of San Francisco or Hongkong, is rare. Level land is so great an asset that many cities, such as Seattle and Boston, have cut down some of their especially inconvenient high places, and used the material to fill up shallow parts of their harbors. Large cities avoid high altitudes as well as rugged relief. Among the cities of over 200,000 population in Tables 4 and 5, only Denver, Tabriz, Teheran, Tiflis, Madrid, and Mexico City are located at high altitudes. All of these except Tiflis, which is in a broad valley, are situated upon piedmont plains of low relief. It seems to be difficult for a great city to grow up where the altitude is great, and almost impossible where the relief is really rugged.

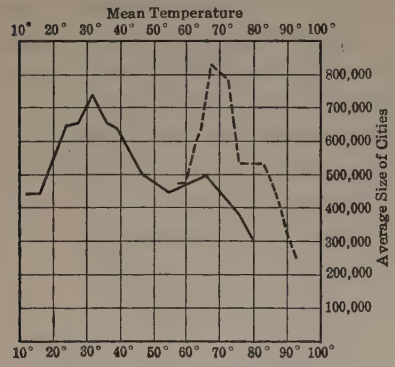


FIG. 122.—Average Size of Large Cities in Relation to Coldest Month (Solid Line) and Warmest Month (Dotted Line).

Great Cities and Water Transportation.—Bodies of water are almost as important as relief in determining what parts of the earth shall have many large cities. Here are the facts as to how the large cities of Tables 4 and 5 are related to bodies of water:

93, with an average population of 636,000, are sea ports.
9, with an average population of 752,000, are lake ports.
42, with an average population of 653,000, are river ports.
46, with an average population of 464,000, have no water communication.

Sites where water communication is available are not 1 per cent as numerous as those where there are no navigable waterways. Yet such sites have been chosen for three times as many large cities as have the vast areas where no navigable waterways exist, and the cities

on the sites beside the oceans, lakes, and rivers are much larger than the others.

Minerals as a Factor in City Distribution.—In many dry parts of the world such as the Rocky Mountain States, northern Mexico, northern Chile, and the interior of Australia, a large part of the cities are mining centers. The same is true in some regions such as Alaska, which are too cold for profitable agriculture, in mountains like the Urals and Erzgebirge, and in certain old worn-down mountains such as those containing the iron ores of Lake Superior. Coal regions, such as South Wales, West Virginia, Pennsylvania, and Kentucky, are full of

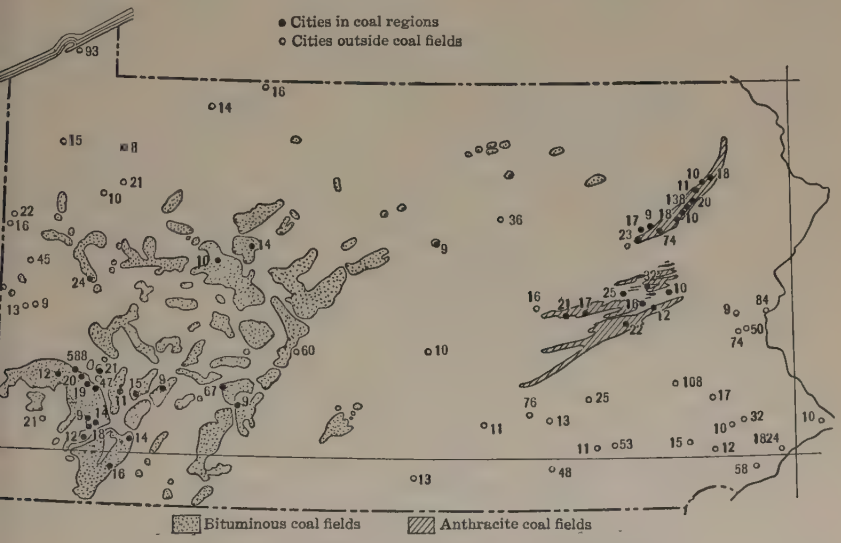


Fig. 123.—Coal Fields and Cities in Pennsylvania.

small mining cities. Mining alone, however, almost never leads to the growth of large cities. A few of fair size, like Johannesburg in South Africa, are indeed almost wholly devoted to mining, but as a rule the mines at any one place do not employ more than a few thousand men. In fact, in our whole list of cities with over 200,000 inhabitants, only Cardiff and Denver, both of which are among the smallest of the great cities, owe their growth largely to mineral production. Even in these it is not actual mining which causes the cities to be large, but the treatment and shipment of the product, together with the work of supplying the small mining towns with food and other goods.

This illustrates the fact that the chief effect of minerals upon the distribution of large cities is accomplished indirectly through the work of manufacturing. How important this is may be judged from Fig. 123

showing all the cities of Pennsylvania, both large and small. The anthracite coal field in the northeast and the bituminous field in the southwest each have a group of coal cities, mostly small, centering around Scranton and Pittsburgh. Although these two coal fields embrace only a small part of the area of Pennsylvania, they support over half of the incorporated cities. Similar conditions prevail in Britain, as is also the case in the coal fields of Belgium, Germany, France, Alabama, and elsewhere.

Soil and Cities.—Good soil, like every other condition that increases the productivity of a region, has a certain tendency to foster the growth of cities. In Alabama, Fig. 22 C, for example, the Black Belt has six small cities within its limits or on its borders, whereas the much larger area to the south has only two. In Kentucky the central part of the Blue Grass region contains six small cities, whereas an area several times as great among the mountains contains none, but this is due to relief much more than to soil. In Iowa, on the other hand, we have seen that in counties containing cities the soil, as judged from the value of the farm land, averages no better than in other counties. Moreover, the prairie states of America and the most fertile plains of India, China, Europe, and South America are by no means the regions where cities are most numerous. Fertile soils undoubtedly play a great part in the growth of cities, but modern transportation permits their influence to be felt thousands of miles away. New York and London probably get as much stimulus from the world's dark-colored fertile soils as do the cities located directly in their midst.

The Character of the Hinterland.—The preceding sentence brings out the fact that the distribution of cities depends not only on specific conditions such as climate, relief, minerals, and soils, but upon the general combination of conditions in the hinterlands. The hinterland proper is the immediate country upon which the city depends for existence, and is distinct from the more distant regions with which the city is in intimate connection.

It is the region whose surplus products the city disposes of and whose demands it tries to supply; the more distant regions are those to which the city reaches out in order to find a market for its hinterland's surplus and to obtain the products which its hinterland does not produce. The commercial city is like a giant sitting at the gateway of his estate. With one hand he sweeps up the products which the people of his hinterland prepare; with the other he reaches far out to other people, strangers perhaps, and offers his people's products in exchange for something which he can hand back to his own subjects. Kansas City, for example, receives corn, wheat, cattle, and other

agricultural produce from its hinterland, which lies mainly to the west of it. It sells its goods largely in the manufacturing cities of the East and even in Europe where Kansas beef, pork, and flour feed the workers who make machinery, cloth, railway cars, and articles of adornment. The hinterlands of cities may overlap, for example that of St. Louis overlaps and partially includes that of Kansas City, for many of the goods that are shipped to or from the latter are bought or sold by merchants in St. Louis. In the same way the hinterland of Chicago overlaps that of both St. Louis and Kansas City, while that of New York extends over most of the northern United States as far as the Rocky Mountains.

The products received from the hinterland of a coastal commercial center are rarely of the same bulk and value as those sent out to other regions. This is evident in many of the cities in Table 39. Regions with more exports than imports have what is called a favorable balance of trade (see Table 38 K), while those with more imports than exports have an unfavorable balance (Table 38 L). An excess of imports over exports, however, is by no means necessarily an unfavorable sign, especially if a city engages in entrepôt trade or is a great financial center. At London, for example, in 1923, for every hundred dollars' worth of exports there were $197 worth of imports. This is because London is a great financial and shipping center. Therefore large sums must be paid to it by foreign countries for interest on investments and for carrying freight in the ships which it owns. These sums are paid in goods, not currency, and hence the imports must exceed the exports. In other cases such as Calcutta, Alexandria, and especially Galveston, the imports are small compared with the exports. In such cases a few raw materials, jute and cotton in the present instances, are raised in great quantities in the hinterlands of the ports and are shipped in an almost unmanufactured state. In general, an undeveloped region with only primitive or simple manufactures exports more than it imports, while the highly developed country imports a great deal and balances this against its investments. The character of a city depends very largely on the nature of the hinterland as thus indicated, for where the product is chiefly raw materials and food the activity is slight. The manufacturing and financial centers that want these products are the places where most of the active buying and selling is done. Thus although both New Orleans and Galveston carry on a greater foreign commerce than Boston or Philadelphia, their rôle is relatively passive. Their commercial activity is much less than that of the northern cities where exports and imports are more nearly equal and more varied so that they require much more planning in order to prepare and sell them.

The Detailed Position of Commercial Centers.—Thus far we have been considering the geographical conditions which cause commercial centers of a particular character or stage of development to be located in certain general types of regions. Now we must consider why the centers are located in particular positions within their general regions and why one position fosters growth far more than another. Except in special cases, such as mining centers, the chief factor here is transportation. A city whose main business is commerce must be so placed that the trade of a certain distinct area flows to it more easily than to any neighboring center. The larger the natural catch basin, the larger the commercial center. Such basins are primarily the natural drainage basins, for man utilizes nature's routes wherever possible, either floating goods down stream or building roads in the valley bottoms. New York City is a famous example of a commercial city which owes much of its supremacy over such neighbors as Philadelphia, Providence, and Boston to the Hudson-Mohawk Valley, which penetrates the Appalachian highland, thus giving easy access to the vast level region extending as far as the Rocky Mountains. St. Louis and New Orleans are other examples of commercial centers whose position depends on the relation of trade routes to river basins. They cannot rival New York and Chicago because their main routes run southward instead of eastward toward the most active regions of the United States and Europe.

The physical conditions which most frequently determine the position of commercial centers may be briefly summed up as follows: (1) Junctions of valleys, which usually means junctions of rivers, as at Pittsburgh. (2) Crossing places of roads in a plain. Generally a plain contains many crossings since the roads and railroads can go almost everywhere. Hence, there are usually many small commercial centers as in Iowa and Indiana, but a great combination of cross roads may cause one city to outrival the others as Indianapolis has done. (3) Mountain gaps. Many trade routes are temporarily dammed as it were by meeting the mountains, and hence have to turn and flow parallel to the mountains until they find a gap, as at Vienna. (4) Breaks in inland water routes also determine the position of a city, as in the case of the falls of the Ohio where Louisville grew up. (5) The crossing places of rivers determine the location of a large number of cities, among which are St. Louis and Omaha. The number of cities whose names contain the syllables " bridge " or " ford," or their foreign equivalents, testifies to the great importance of this cause which determined the original position of many great cities, including London and Paris. (6) The heads and to a less extent any main indentations of lakes, and the places where lakes meet land routes are favorable

for the growth of commercial centers. Buffalo, Chicago, and Duluth are examples. (7) Closely allied to the lake centers of commerce are cities like Albany at the head of deep-water navigation. Such places, like most of those where land and water meet, owe much of their importance to the fact that the means of transportation must be changed. The cargo must be transferred from ocean vessels to canal boats, railways, or trucks.

(8) Last and most important are the places where land routes meet ocean routes, their importance is due to the extreme cheapness and ease of water transportation, and to the fact that when goods are once on the water they can be carried immense distances and in a great many directions without trans-shipment. To-day, the oceans, instead of being barriers to commerce, may almost be called magnets. The Atlantic draws the United States into intimate contact with Europe and make us share the problems of that continent whether we will or no. The Pacific draws us toward Japan and China so that we cannot ignore what happens in those countries. Commerce thinks of the ocean as a great level track with infinite switching possibilities and requiring far less fuel than even the best railway.

Ocean ports may be divided into four types according to the character of the harbor and its relation to routes on the land: (*A*) Open roadsteads such as Boulogne. These are usually poor because they do not offer good, safe harbors with plenty of depth and protection from the winds and waves. Also, they are rarely located at the mouths of large valleys, so that transportation toward the interior is hampered. (*B*) Bay ports like Boston. At such places the harbor may be safe, commodious, and deeper than that of Boston, and there may be plenty of room for docks and for a city; but if they are like Boston in lacking a gentle, easy valley leading far into the interior, they are much hampered. If the Hudson Valley ran eastward instead of southward from Albany, Boston rather than New York might be America's greatest city. (*C*) River ports like New Orleans and Antwerp have the advantage of easy communication inland, but are often hampered by lack of depth and of space for anchorage, docks, and wharves. Only by extensive digging or by going far up or down the river can room be found. (*D*) Ports with both a bay and a river, as at New York and San Francisco, are the most fortunate of all. They usually combine safe and commodious anchorage with plenty of room for docks and wharves and with easy access to the interior. Nevertheless, they do not necessarily determine the positions of the largest cities, for Riga, and Nikolaiyevsk at the mouth of the Amur have such positions. So, too, does Smyrna, but it does not rival Boston, for example.

The growth of a commercial center is due primarily to the character of its hinterland. The part played by transportation is to determine the exact position of the city which is bound to grow up somewhere in order to handle the commerce of the hinterland. Constantinople, more than almost any other city, owes its growth to its wonderful combination of (*a*) a large bay, (*b*) a drowned river, (*c*) a deep inlet from the ocean extending far inland via the Black Sea, and (*d*) the crossing of land and water routes. Yet though its immediate position is perhaps more advantageous than that of any other city, it does not rival New York, London, Paris, Tokio, Chicago, Berlin, and Philadelphia because it is not located in a region where cities as great as those just mentioned are yet needed.

The Human Factor in the Growth of Ports.—In the days of sailing vessels and post roads, time was by no means so great a factor in transportation as to-day. Delays were expected because they were frequent, but to-day even an ocean steamer is expected to arrive almost on time. This change has occurred partly because of the expense of operating railroads and steamships. If a great steamer must lie idle waiting for room to dock or for a proper tide, the cost, including interest on the investment as well as wages, wear and tear, may run up to $5000 per day, and even on a train a delay of a few hours is very costly. Consequently, railway yards, warehouses, dockage space, equipment for loading and unloading, deep channels, and the other facilities provided by man are often more important than natural advantages in helping a city to grow commercially. Since shipping, far more than land commerce, can easily move from port to port, the up-to-date ports of the world vie with each other in attracting it by providing facilities for loading and unloading quickly and cheaply. Conveyor belts and lifting towers, chutes, escalators, cranes, and cold-storage warehouses are only a part of the equipment, although even so there is still a great amount of work for longshoremen.

The problem of building piers illustrates the human element in the growth of ports. Most American ports have room enough to build piers which are relatively cheap, but Hamburg, for example, has had to overcome the difficulty of a narrow river by the expensive method of digging slips. London and Liverpool have a disadvantage which most American and German ports do not suffer, for the rise of the tide is excessive. So English engineers have devised a system of docks that can be closed like locks. The question of the ownership of wharves is important, for dockage rates and management have almost as much to do with the attractiveness of a port as have the channel, wharves, and warehouses. Some ports are owned by the public, for example,

the municipal ports of Hamburg, Rotterdam, Antwerp, and Bristol. Others, including those of London, Liverpool, and Seattle are administered as public trusts by the government; and still others, including Galveston, Savannah, and Southampton, are owned by private companies. In Europe, public ownership predominates. In the United States the semi-public type is most common where the Federal Government combines with the state or city or both, and where railroads and special dock companies also control part of the port.

A fine example of well-planned port facilities is the Bush Terminal at New York City. Built as an experiment, it was largely ignored by steamers for several years until its owners' enterprise had convinced shippers of its practicability. Now it forms a small but complete commercial city in itself, with a subsidiary manufacturing city. When the terminal was completed its facilities included 8 piers, 2 floating bridges, 116 warehouses, a cold storage plant with a capacity of a million cubic feet, 9 car floats, 16 barges, 11 locomotives, and 30 miles of track. Eighteen steamship lines operated from the terminal to foreign ports all the way from Norway to Zanzibar, and over a million tons of freight were handled. In addition to this there were 16 loft buildings, each a block in size, and together housing 220 industries. The working population of the terminal amounted to 24,000 people, which means that they and their families numbered at least a hundred thousand. So huge and complicated an organization is possible only where a great number of geographical conditions combine to produce a commercial city of the maximum size, with a maximum degree of activity, and serving a highly developed and populous hinterland with enormous resources.

Cities and Density of Population.—Human factors are as important in determining the general location of cities as in determining which of several individual cities in any given region shall grow most rapidly. The greatest of these factors is the general stage of development and the productivity of the people. It is often supposed that density of population also has much to do with the distribution of cities. In a certain sense this is true, for if the population is dense there must be many centers of commerce. But these centers may be of insignificant size, as in Java with its almost unequaled density of population. The point to be noted is that the *percentage* of city dwellers has little to do with the density of population. South Carolina, for example, has 55 people per square mile, but only 10 per cent of them live in cities; California, on the contrary, has 22 per square mile, but 57 per cent of them are in cities. It is likewise true that New Mexico has only about 3 people per square mile, and only 4 per cent of these live in cities of over 10,000;

while Rhode Island has nearly 600 people per square mile, and 83 per cent of them live in cities.

Java and Australia illustrate the same thing as the Carolinas and California, but on a much more extreme scale, while England belongs to the same type as Rhode Island. Java has as many people as England and more than six times as many as Australia. Yet it has only two cities of over 200,000 population, Batavia with 300,000 people, and Soerabaya with 200,000. England, omitting Scotland, has 19 such cities with an average size of 600,000, and Australia has four averaging 587,000. So far as the total city population is concerned, the discrepancy is still greater, for Java has $2\frac{1}{2}$ million people in great cities, while England has $11\frac{1}{2}$, and Australia $2\frac{1}{2}$. Now Java is one of the most densely populated places in the world—692 per square mile, against 700 per square mile in England. Moreover, its population, as measured by tropical standards, is industrious, peaceful, and commercially inclined. The island lies not far from the great trade route between Europe and the Far East, and it is well governed by a very active Dutch community. Thus, it has many of the most important conditions which lead to the growth of cities. Australia, on the other hand, has only 2 people per square mile and only 18 even in a relatively well-settled part like Victoria where the climate is good. Yet Australia's six state capitals contain almost exactly as many people as all of Java's cities of over 10,000. How can so many people live on the farms in Java? How can so many live in the cities of Australia where manufacturing is still in its youth?

So far as Java is concerned, the answer lies partly in the extreme fertility of the volcanic soil, the large percentage of the total area that is capable of cultivation, the warm, rainy equatorial climate which makes it possible to raise two or three crops almost everywhere, the small size of the Javanese people which diminishes their requirements for food, and the climatic conditions which also diminish the requirements for food and at the same time make it possible to get along with very little in the way of clothing and shelter. More important than these, however, are the temperament and habits of the people which not only cause them to be relatively unproductive (Fig. 2), but to be satisfied with a standard of living which requires little beyond the food needed to support life. Australia, on the other hand, can support a huge proportion of its people in cities not because its soil is especially productive, its minerals especially abundant, or its climate propitious to agriculture, but because its people are few in proportion to the resources, and especially because they have the pioneer temperament which impels them to great and persistent activity.

Great Cities and Stage of Civilization.—This leads us to inquire how far civilization and cities are connected. A comparison of Fig. 119 with Fig. 48, showing the distribution of civilization, gives the following result:

Stage of Civilization	Approximate Population	Number of Great Cities	Average Size of Great Cities	Approximate Percentage of Population in Great Cities
Very high.....	280,000,000	98	649,000	23
High.....	250,000,000	33	653,000	9
Medium.....	720,000,000	41	550,000	3
Low.....	450,000,000	16	330,000	1
Very low.....	110,000,000	2	238,000	½

This table is like the one where climate and the people in cities were compared, but is more regular, and the contrasts between the highest and lowest are greater. The legitimate inference seems to be that the stage of civilization is the primary factor which determines the degree to which great cities develop. But civilization, as the term is generally employed, is mainly an expression of human activity and productivity. Thus our chief conclusion is that great cities and a high percentage of city dwellers are mainly a result of high productivity.

EXERCISES AND PROBLEMS

1. Distribution of urban population. Draw three isopleth maps based on columns E and F in Table 2 and B in Table 5. What other maps do these resemble? Why? Which of your three maps is most regular? Why? What does this indicate as to the relation between climate, civilization, and cities?

2. On the maps of Exercise 1 insert the metropolitan districts of Table 6, and the European cities of over 300,000 population from Table 4. Beside each city insert a bar proportioned to the foreign commerce as shown in column C of Table 39. What does your map suggest as to the degree to which foreign commerce is concentrated in a few cities?

3. Classify the cities of over 300,000 population in Table 4 and in column B of Table 6 as (*a*) seaports or river ports reached by ocean traffic, (*b*) lake ports, (*c*) river or canal ports not reached by ocean steamers, (*d*) cities that are not ports. Find the total number and average size of each of these groups. How does the number of sites where seaports and lake ports might be located compare with the number where river ports and cities that are not ports might be located? How far do the river ports owe their growth to water-borne river traffic? What do you conclude as to the importance of oceans, great lakes and other connected waterways in the growth of cities?

4. From Table 39 make a table of the fifteen cities with the greatest total foreign commerce. After each city indicate (*a*) population (Tables 4 and 6); (*b*) population of country (Table 1); (*c*) whether imports or exports are in excess; (*d*) mean temperature (average of July and January, Figs. 4 and 5); (*e*) kind of harbor, i.e., (drowned coast, river, artificial, etc.); (*f*) position on map of civilization (high, low, etc., in Fig. 48); (*g*) main kinds of exports and imports by general classes (Tables 42–44). Summarize the geographical conditions which determine the location of the greatest cities.

5. On an outline map of the United States let one group of students insert for each city or district two bars proportional to the values of imports (column A) and of exports (column C), respectively, in Table 41. Let another group do the same for the tonnage of imports and exports (columns B and D). In what parts of the country are the exports (*a*) more valuable, (*b*) more bulky than the imports or the reverse? Describe whatever systematic differences there are between cities so located that their trade in one direction is much more valuable or more bulky than in the other.

PART III

THE UNITED STATES AND CANADA

CHAPTER XXIII

INDUSTRIES WHERE MAN ROBS NATURE

The Natural Advantages of the United States.—No other country rivals the United States in wealth. Before the Great War the average wealth per capital was over $2000, and now, because of the increase in prices, it is about $3000. Great Britain ($2500), Canada ($2475), France ($2300), Australia ($1725), and New Zealand ($1380) appear to come next, although these figures are not very reliable because estimated according to different systems. They serve, however, to bring out the great concentration of wealth in the United States. The cause of such concentration is one of the great geographical questions. Why is the wealth per person in the United States, even under normal conditions, more than in the most progressive part of Europe, ten times as great as in Japan, and possibly fifty times as great as in China?

The answer lies chiefly in four conditions: (1) the racial and social inheritance of the inhabitants, (2) the absence of any large settled aboriginal population, (3) the excellent climate, (4) the great and undeveloped natural resources of a new country, and (5) the fact that the population is still only moderately dense.

(1) The original colonists were largely a picked group with uncommonly high ideals and strong characters. The Pilgrims, Puritans, Quakers, and Huguenots thought for themselves and did what they believed right even when others opposed them. They not only brought to America some of the best ideas of Europe but had other ideas of their own. Many other early immigrants had the thrift to save money for a long, hazardous and expensive voyage, and the courage and love of adventure that made them willing to face the hardships of the wilderness. In later years these higher types of immigrants have been diluted by people of less ability, who were poor or unhappy at home and hoped here to find wealth and comfort. To-day Canada receives a much

higher type of immigration than the United States, for it carefully weeds out the unfit by inspection in their own homes. Nevertheless, the people of the United States as well as Canada are still of relatively high quality and preserve a high standard of living because a large proportion are descended from Europeans who had more than the average ability and character.

(2) The immigrants to temperate North America were fortunate in going to a region where the population was sparse and also nomadic. When an advanced race settles among an aboriginal race having different ideals and lower standards, as in Mexico, Peru, and South Africa, it almost inevitably is held back or deteriorates. Fortunately for the United States and Canada, the scanty Indian population consisted largely of hunting tribes who moved westward as the white man advanced. Hence, except where the mistake was made of introducing slaves and later of fostering a poor type of immigration, these countries have been free from racial handicaps such as are the bane of South Africa and much of South America.

(3) The United States and southern Canada contain the only great section of the world where the climate rivals that of Europe in its combined advantages for both agriculture and man. Agriculture is almost incalculably benefited by having sufficient rain at all seasons and relatively little variation from year to year. Man, as appears in Chapters VIII and IX, has the best health and most energy in a climate with storms at all seasons and with a strong but not excessive contrast between summer and winter.

(4) A country with the preceding advantages is just the place where abundant undeveloped natural resources are most important, especially if transportation is easy. In North America, when the white man first came, the greatest resource was the virgin soil, especially in the central plains. The other natural resources are chiefly the minerals, forests, and fish. These last three are the subject of the rest of this chapter; they give rise to the industries which most ruthlessly rob Nature of her wealth without putting back anything in return.

(5) One of the great advantages of the United States is that its population is less dense than that of most parts of the world. There is much dispute as to whether a low standard of living leads to density of population or whether density of population leads to a low standard of living. The fact probably is that the two things work together. If for any reason population is allowed to become too dense, as appears to have happened in the Kentucky mountains, the standards of living must either fall because there is not land enough to provide sufficient products for all, or else a community must somehow draw upon other regions either

through migration or by taking up occupations such as manufacturing and then bringing food and raw materials from elsewhere. On the other hand, if the standard of living is lowered for any cause whatever, the population is almost sure to increase. The United States at present is in the fortunate position of having a high standard of living and of not yet feeling serious pressure from population. Nevertheless, it is an ominous sign that the most densely populated parts of the United States are also the parts where there is the greatest poverty and where the standards of living show most tendency to fall.

The Mineral Wealth of North America.—In the accompanying table compare the percentage of the world's production of minerals derived from each continent, with the corresponding percentages of population

APPROXIMATE PERCENTAGE OF WORLD'S MINERAL PRODUCTION BY CONTINENTS, 1923

Mineral	Africa	Asia	Australasia	Europe	North America	South America	United States
Aluminum	.....	.....	.....	37	63	.....	54
Antimony	7	73	3	13	1	3	
Asphalt *	.....	.....	.....	46	54	.....	7
Bauxite	.....	1	.....	41	47	11	41
Coal	1	5	1	50	43	.....	42
Copper	½	4½	1	8	65	21	54
Gold	57	5	6	1½	27	3½	14
Graphite	13	30	.....	51	6	.....	3
Gypsum	.....	1	1	5	93	.....	83
Pig iron	.....	1	.....	38	61	.....	59
Lead	2	4	10	25	58	.....	44
Magnesite	.....	3	1	86	10	.....	8
Manganese	17	44	.....	7	2	30	1
Nickel *	.....	.....	11	4	85	.....	2
Petroleum	.....	5	.....	5	88	1	73
Phosphate	49	.....	.....	3	48	.....	48
Platinum	.....	.....	.....	37	3	60	1
Pyrite	.....	6	.....	86	8	.....	7
Salt	1½	22½	.....	43	32	1	30
Silver	1	4	4	3	77	11	30
Sulphur	.....	2	.....	15	82	1	82
Tin	6	69	1	.....	.....	24	
Tungsten	.....	78	1	17	3	1	3
Zinc	6	1	4	40	49	.....	46
Population	7.8	51.5	0.4	28.2	8.6	3.5	6.3

* 1913.

in the bottom line. In North America, only antimony, graphite, manganese, platinum, pyrite, and tin are produced in quantities less than would be expected if production depended solely on the number of people. The same is true of the United States, except that nickel must be added to the exceptions, and pyrite omitted. In thirteen cases the percentages for North America are more than four times the percentage of population. The only important minerals in which any continent except Europe excels North America are antimony, gold, phosphates, platinum, tin, and tungsten. In proportion to the population the production of minerals in North America, and especially in the United States, exceeds that of every other continent. In mineral reserves, as opposed to mineral production, North America similarly leads in many respects, although here we cannot speak so positively. But even if large discoveries should be made in other continents, North America, and especially the United States, will not easily lose their high rank.

The Relative Importance of Mineral Products.—The importance of mineral products is almost incalculable. The discovery of how to smelt iron ranks with the introduction of speech, fire, tools, domestic animals, agriculture, and the wheel as a great epoch in human progress. Nevertheless in 1919, the year covered by the census of 1920, the mineral wealth produced in the United States was worth only $4\frac{1}{2}$ billion dollars compared with 20 billion for farm products, and 25 billion as the value added by manufacturing. Indeed, the mineral production that year was less valuable than two great crops, corn (3850 million) and wheat (2 billion). Thus, important as minerals are, they cannot compare either with the soil or with human labor as a source of wealth.

The accompanying table shows the relative values of the mineral products of the United States. The fuels are worth more than twice, and the quarry products three-fourths, as much as the metals. Ordinary stone produced in the United States is worth about three times as much as silver or gold, while sand exceeds lead.

Distribution of Mineral Production in the United States.—Figures 124, 125, and 126, showing the distribution of fuels, metals, and the non-metals other than fuels in the United States and Canada, present an interesting contrast. The most noteworthy general features are: (1) the far denser shading of the fuel map than of either of the others; (2) the wide distribution of fuels in the United States and their scarcity in Canada; (3) the fact that only in the production of the non-metals other than fuels does Canada seem to rank with the United States in proportion to population. In the fuel map, Fig. 124, the enormous concentration in Pennsylvania and West Virginia represents not only all the true anthracite coal of the world and the best part of the bitumin-

VALUE OF MINERALS PRODUCED TO A VALUE OF OVER $20,000,000 IN THE UNITED STATES IN 1923

(Expressed in Millions of Dollars)

Fuels		Metals		Non-Metals	
Bituminous coal	1636	Pig iron	936	Clay products, brick	407
Petroleum	931	Copper	211	Cement	260
Pennsylvania anthracite	492	Lead	76	Stone	162
Natural gas	250	Zinc	69	Sand	91
Natural-gas gasoline	74	Silver	60	Lime	39
		Gold	52	Gypsum	35
		Iron alloys	48	Salt	28
		Aluminum	28	Sulphur	26
		All other	18	Mineral pigments semi-metallic	24
				All other	87
Total	3383	Total	1498	Total	4133

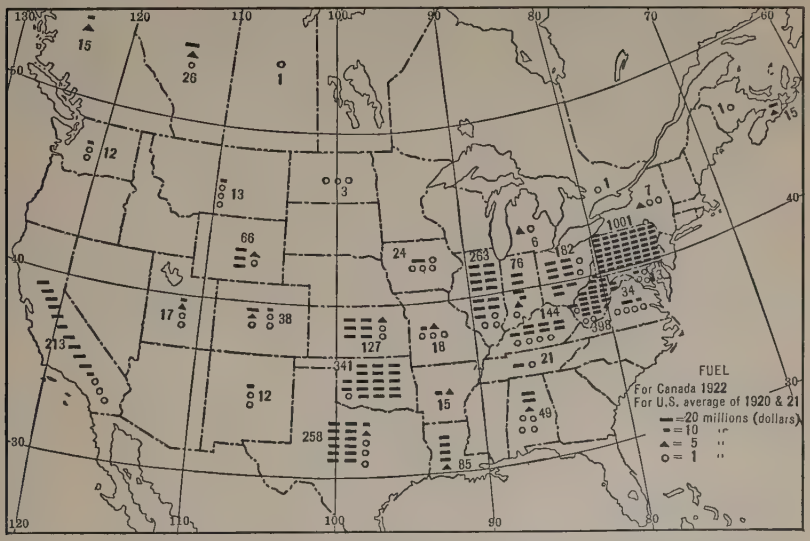


FIG. 124.—Annual Production of Fuels in the United States and Canada.

ous coal of the United States, but also considerable supplies of petroleum and natural gas. This eastern area of abundant fuels continues to Illinois on the west and Alabama on the south. Probably no other part of the world is so well supplied with high-grade fuel. A second important concentration centers in Kansas, Oklahoma, and Texas and extends

over into the neighboring states. It represents a fair production of coal and a huge production of petroleum. A third but much smaller concentration in California is due to petroleum alone. In Canada the value of the entire production of fuels is approximately the same as in Colorado, and less than in thirteen other states.

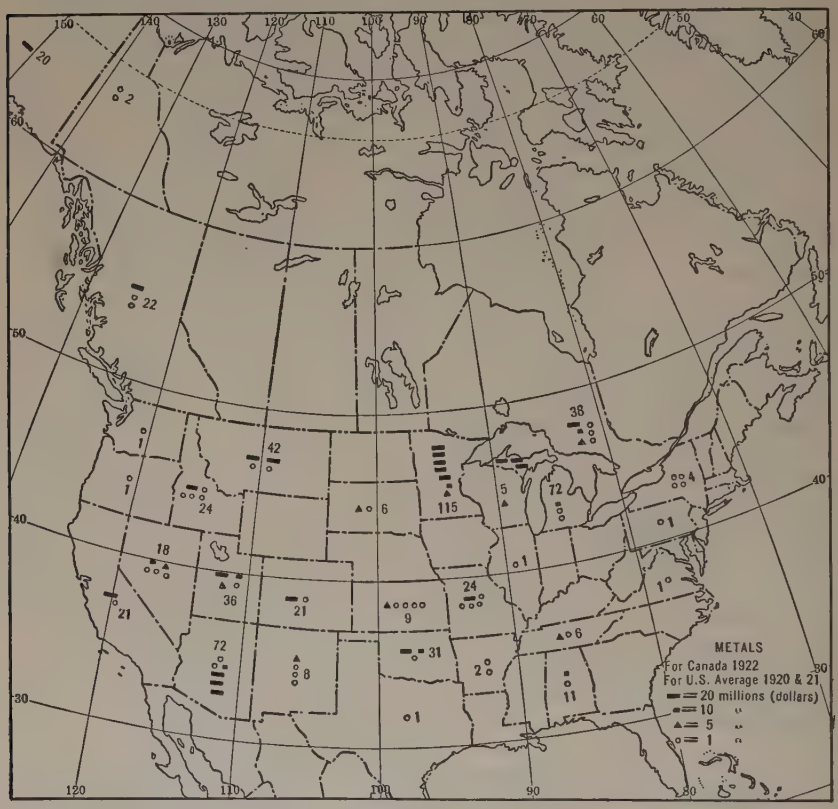


FIG. 125.—Annual Production of Metals in the United States (1920–1921) and Canada (1922).

The metals of the United States and Canada show a much less marked concentration than do the fuels. By far the greatest concentration occurs in the Lake Superior region and is due mainly to iron ore, although there is also a little copper. Arizona and the entire tier of Rocky Mountain States as far as British Columbia likewise show a rather high degree of productivity in the metals, but this is not so conspicuous as might be expected from the reputation which these states have acquired as mining centers. Copper and silver, with smaller amounts of lead, zinc, and gold, are the main metallic products of the

Rocky Mountain area. A third distinct mineral-producing area is the lead and zinc region of Missouri. The non-metals other than fuels, on the other hand, are distributed quite evenly over the country. In a general way their value bears a fairly close relation to the density of population and the activity of business. Quarrying, like agriculture, is a relatively universal occupation, not only in the United States but in almost all well-inhabited countries, except plains with deep soil and tropical regions with a dense cover of vegetation. In the United

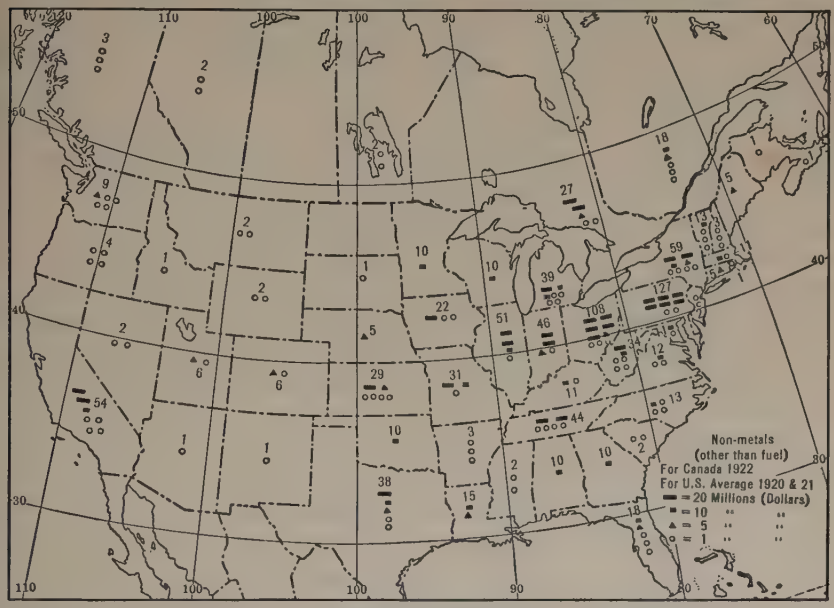


Fig. 126.—Annual Production of Non-metallic Minerals Other than Fuels in the United States and Canada.

States, however, its products are worth scarcely one-twentieth as much as the agricultural products.

The value of the output of minerals per worker in various regions varies far more erratically than does the similar value in agriculture or manufacturing. This is due to great differences in (1) the richness of mines, (2) the depth at which the ore is dug, (3) expenses in draining and ventilating the mines, (4) transportation, and (5) the amount of material that must be removed to get a given product. Thus in 1919 the production of copper per worker in the copper industry was $6\frac{1}{2}$ tons in Michigan, nearly 16 in Idaho, and nearly 19 in Arizona. In Texas, where the oil wells average 27 barrels per day, there is only one worker for each 7100 barrels produced per year, while in Pennsylvania where the

wells are old and average only 0.3 barrel per day the annual production per man is 820 barrels. Another noteworthy difference between mining and agriculture is the extreme localization of each product. Iowa, for example, is a great corn state, but corn furnished only 39 per cent of the value of its farm products in 1919, while animals furnished about 25, wheat 11, and hay 11. In Mississippi, one of the states where the one-crop system is most persistent, 54 per cent of the value of the farm products in 1919 was due to cotton, 18 to corn, and 14 to animals. On the other hand, in Pennsylvania, coal mining employs over 93 per cent of the persons engaged in mining; in Arizona an equal percentage is engaged in mining copper, and in four-fifths of the states over half the mining population is engaged in a single industry. In more than half the states the three leading mineral industries employ more than 90 per cent of all the people engaged in such occupations. This means that in mining regions, as in those devoted to one-crop agriculture, if the main industry suffers there is little else to fall back on.

The Problem of the Mineral Industries.—Every industry has its own problems, which often have a widespread effect. For example, how far can the production of gold be increased without lessening the value of the product? Anything that lowers the cost of producing gold immediately increases the supply of gold brought to the mints, and raises the gold reserves. This tends to make money cheap, which is the same as making prices high. Thus any marked change in the rate at which gold is produced not only makes trouble in business, but raises a serious problem for the owner of gold mines.

The production of most mineral products varies according to the general conditions of business. The demand for iron, as we have seen, is regarded as a good indication of the general trend of business. Among the metals the price of copper is especially subject to fluctuations. Hence, copper mines often suffer periods of stagnation and the stock of copper companies is a favorite among stock market manipulators. Of late, petroleum has been the most variable of all the main mineral products, both in the amount of production in any given area and in the price of the stock of its companies. Variations in mineral production have a great effect not only on the local population, but upon financial centers through fluctuations in dividends, in the price of stock, and in the calls for new investments. The price of mineral products often determines how active many kinds of factories shall be.

Many fluctuations in mineral production arise from causes outside the general conditions of business. For example, the seasonal character of the coal business works much harm in this greatest of all mineral industries. Although industrial consumers create a demand for coal all the year, they burn more in the winter than the summer, not only

because of the low temperature but because the busy season is more apt to come in winter. In the United States, domestic users, who consume about 120 million tons per year against 180 million by manufacturers, 125 million by railroads, and 10 million by steamships, provide an extremely seasonal market. Hence, the miners often work only part time. They have struck more than once in order to assure themselves at least thirty hours of work per week and wages enough in that time to enable them to support their families. They would work full time at lower hourly wages, if they were sure of full-time work all the year. One remedy for this lies in storing coal during the dull season. With proper machinery the cost of putting it into storage and taking it out again is only 10 to 15 cents a ton. Such storage would reduce the cost of mining, free labor for other industries, and help the railroads. At present the railroads require an unnecessarily large equipment because there is a great demand for coal cars in the autumn while many are idle in the spring. The coal trains require engines and crews just when the crops also make great demands. In coal mining, more than in most businesses, one of the greatest needs is to overcome the effect of the seasons and create a uniform flow of business. The great difficulties of West Virginia in education, in public safety, and in other respects would be distinctly helped if the coal miners had steady work at fair wages all the year.

Another very serious type of fluctuation in the coal business arises from the fact that in no other industry are strikes so frequent, so widespread, and so prolonged. Here is the record of strikes in the coal mines of the United States for twenty-three years:

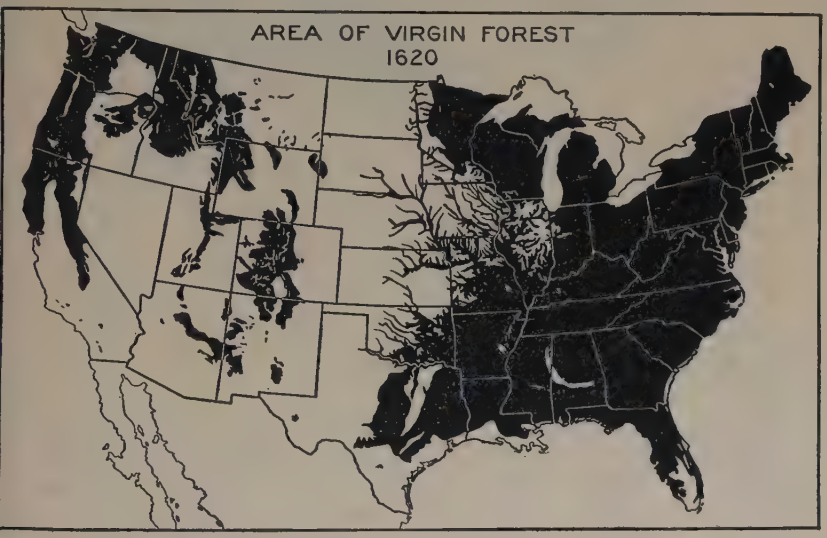
Year	Thousands		Average Days Lost per Man	Year	Thousands		Average Days Lost per Man
	Men on Strike	Working Days Lost			Men on Strike	Working Days Lost	
1900	132	4,878	37	1912	311	12,527	40
1901	21	734	35	1913	135	3,049	23
1902	200	16,672	83	1914	162	11,014	68
1903	47	1,341	28	1915	67	2,467	37
1904	78	3,383	43	1916	171	3,345	20
1905	38	797	21	1917	160	2,348	15
1906	372	19,201	52	1918	79	509	6
1907	33	462	14	1919	453	15,761	35
1908	145	5,450	38	1920	282	5,914	21
1909	25	724	29	1921	151	3,106	21
1910	218	19,251	88	1922	603	73,497	122
1911	41	984	24				
				Average.	171	9,018	39

The record indicates an average loss of about $125 per miner in wages each year, or one-sixth of the average income. The great coal strike of 1922 is estimated to have cost the miners $50,000,000 per month in wages, the operators $30,000,000, and the general public another huge sum. The anthracite strike in 1925 and 1926 was even worse. It lasted 165 days, affected 828 mines and 158,000 men, and cost toward a million dollars a day in wages, half as much in profits to the mine owners, and perhaps half a billion dollars in all.

In no other state is the percentage of miners so high as in West Virginia, and nowhere else are serious strikes so common. During the present century civil war has almost occurred several times when the private police of the mine owners have struggled with the miners.

The fluctuations due to the exhaustion of supplies are in the long run far more dangerous than any other fluctuations in mineral production. Fortunately this does not yet apply to coal, iron, aluminum, stone, clay, and lime. It applies, however, to most of the other metals and rarer mineral products. Abandoned copper, lead, and zinc mines can be counted by the hundred in various parts of the world; old gold-dredging operations in California have left certain river valleys a mere waste of gravel. The world would probably soon want hundreds of times the present supply of platinum, tungsten and other rare minerals, if the supply were abundant. The scarcity of many minerals was especially emphasized during the Great War. For example, the United States is the largest user of chromite, but is not normally a large producer. In 1913 the domestic production was only 230 tons, or less than half of 1 per cent of the normal consumption of 65,000 tons, used mainly for special kinds of steel, for tanning leather and for refractory brick and furnace lining. By developing small deposits, the United States raised its production to nearly 84,000 tons in 1918, an amount almost equal to the imports of that year. But a few years of use on such a scale would much deplete the better deposits. Chromite is simply one of many minerals which have a great and growing value, but which appear to exist only in such small quantities that a century or two of exploitation like that which is now going on would practically exhaust them. No one who has any regard for the future can fail to feel the imperative need of careful conservation. It is not surprising that after the Great War no problems were harder to solve than those centering around rights to mineral wealth. A possible step toward the solution of some of these problems is thought by many people to lie in the growing movement toward vesting all mineral rights in the general public, while allowing and encouraging private enterprises to develop the minerals.

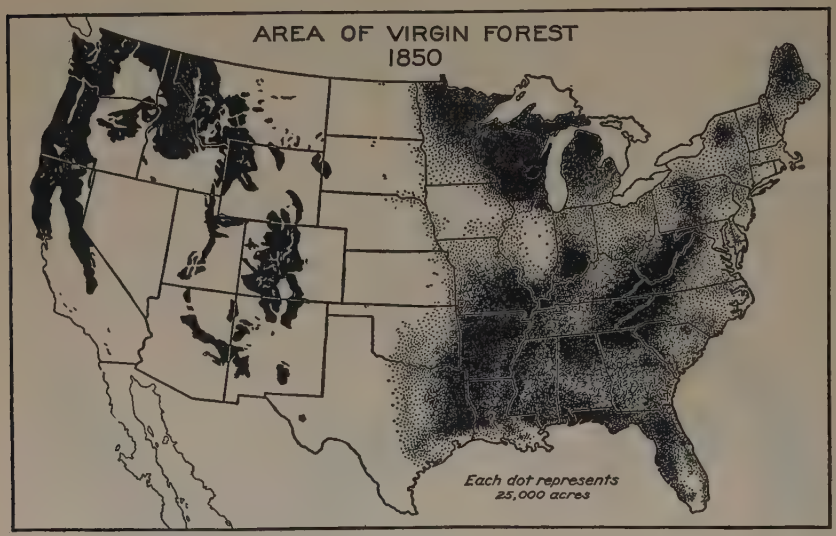
The Great Use of Wood in the United States and Canada.—City people with their brick houses, iron fences, and coal for fuel rarely appreciate the importance of wood. Nevertheless, half the buildings in the United States and more than half in Canada are made of wood. It is estimated that nearly half the inhabitants employ wood extensively for fuel. Farmers are the greatest users of wood, for their buildings, implements, barrels, boxes, fences, and cordwood probably account for fully half the supply. To-day the United States is the world's greatest producer of wood, while Canada produces vast supplies in proportion to her population. Russia has a larger acreage of forests than the two Amer-



Courtesy of the United States Forest Service.

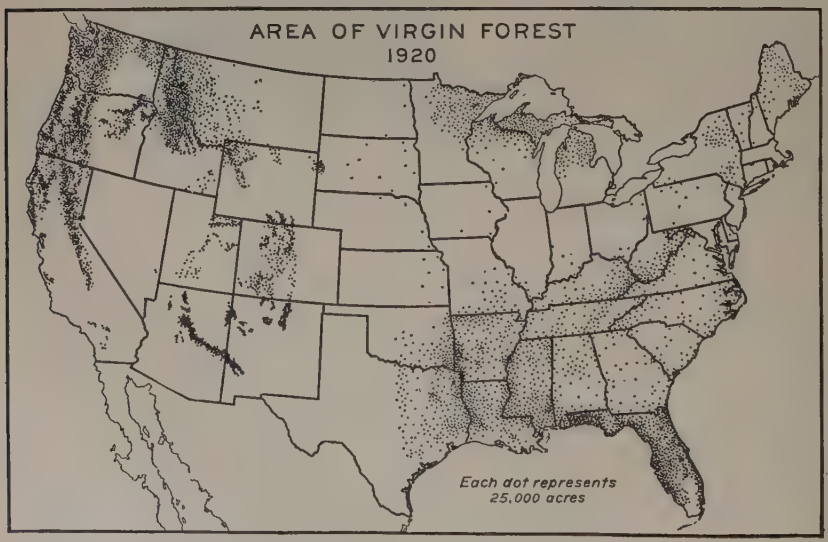
FIG. 127.—Forests of the United States in 1620.

can countries, but it has not developed its supplies on a large scale. The estimated forest reserves of Canada, nearly one million million board feet, and of the United States, over two million million, are probably not over thirty times as much as the United States uses each year. In fact, the United States each year uses more than four times the annual growth of its forests. Almost no other country uses wood so freely, the average per capita consumption of lumber aside from fire wood being normally over 300 board feet in the United States, 150 in Germany, and 120 in Great Britain. Three-fifths of the United States forests are already gone and most of the timber which could easily be transported to large centers of population is exhausted (Figs. 127 to 129). Half of the timber still standing is in three states, Washington, Oregon, and



Courtesy of the United States Forest Service.

FIG. 128.—Forests of the United States in 1850.

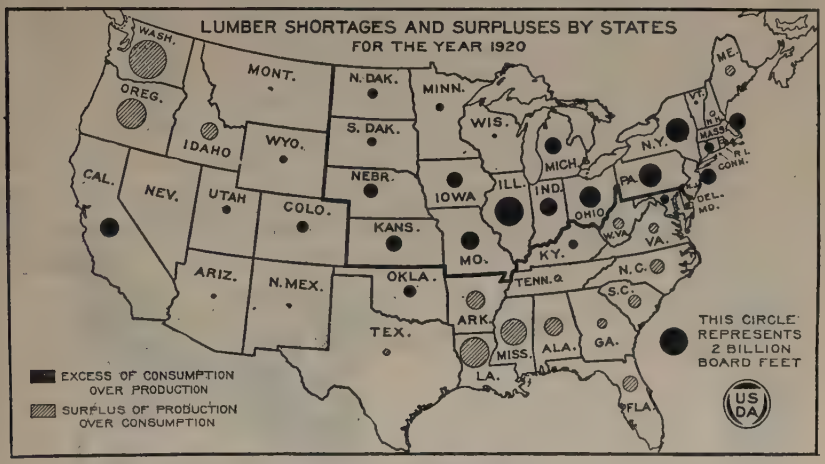


Courtesy of the United States Forest Service.

FIG. 129.—Forests of the United States in 1920.

California, while British Columbia contains nearly half the Canadian supply, including by far the best grades (Fig. 130).

Changes in the Forest Industries.—Three great changes are taking place in the use of forest products in the United States. (1) The location of the main supply has moved southward and westward; (2) the relative importance of different kinds of wood has changed; (3) the methods of cutting and of conservation have altered. Until about 1850 the pine woods from Maine to northern New York and Pennsylvania were the chief sources of softwood, white pine being the chief species and also much the best. Even in 1880 Maine still stood seventh, and New York fourth, among the lumber-producing states, as appears in the



Courtesy of U. S. Department of Agriculture.

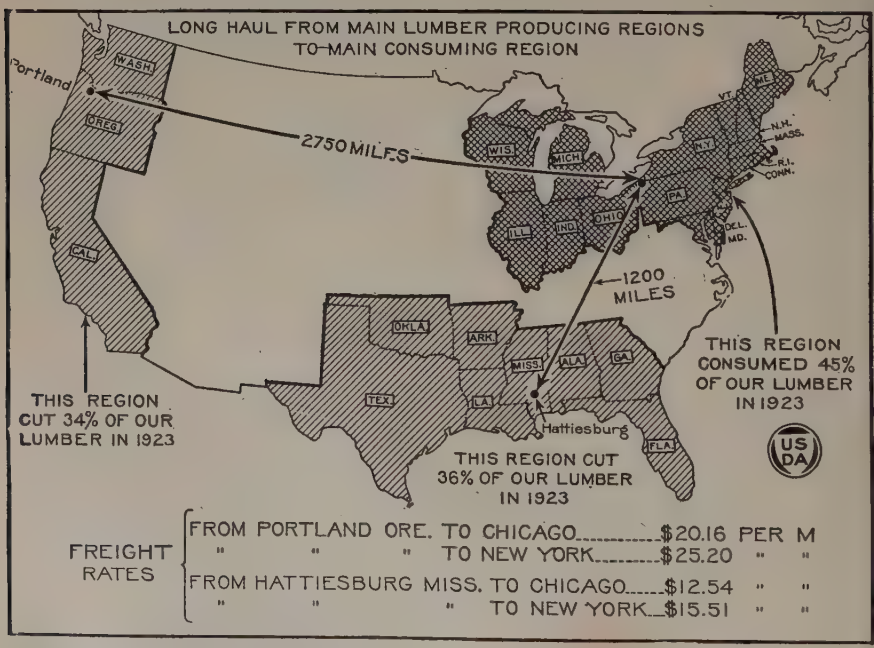
Fig. 130.—Lumber Shortages and Surpluses in the United States.

following table. Then the northern parts of the Lake States, especially Michigan, Wisconsin, and Minnesota, became the center of supply, as appears from the order of the states in 1890. The production of white pine in the Lake States rose from $3\frac{1}{2}$ million board feet in 1877, to $8\frac{1}{2}$ in 1892, and then fell to 3 in 1906. Next the growing need of softwood led to the exploitation of the great forests of the southern part of the Atlantic coastal plain, bringing Georgia and North Carolina among the first eight states in 1900 and advancing Louisiana to second place in 1910. But the South could not furnish enough, and in 1910 Washington had become the greatest lumber producer, while the great coniferous forests of the Pacific mountains also placed Oregon and California among the first eight states. With hardwood a change in location has likewise occurred. The oak and maple of the states from

Pennsylvania to Michigan helped to give them a high place up to 1900, but now Tennessee and Arkansas have come into prominence. The hardwoods grow chiefly on the best soils and in the best climates. Hence, the area where they are still raised is greatly restricted by the growth of farming.

RANK OF STATES IN LUMBER PRODUCTION

Rank	1880	1890	1900	1910	1915	1918	1922
1	Mich.	Mich.	Wis.	Wash.	Wash.	Wash.	Wash.
2	Penn.	Wis.	Mich.	La.	La.	La.	La.
3	Wis.	Penn.	Minn.	Miss.	Miss.	Ore.	Ore.
4	N. Y.	Minn.	Penn.	Ore.	N. C.	Miss.	Miss.
5	Ind.	Wash.	Ark.	Wis.	Ark.	Ark.	Cal.
6	Ohio	N. Y.	Wash.	Ark.	Tex.	Tex.	Tex.
7	Me.	Tex.	Ga.	Tex.	Ore.	Cal.	Ala.
8	Minn.	Ind.	N. C.	N. C.	Ala.	Ala.	Ark.



Courtesy of U. S. Department of Agriculture.

FIG. 131.—The Long Haul of Lumber in the United States.

The change in the location of the American sources of lumber has had a pronounced effect upon the cost of transportation (Fig. 131).

In 1923 about 34 per cent of our lumber came from mills on the Pacific Coast, and 36 per cent from those in the southern states. But two-thirds of the demand is still in the northeastern states from Illinois to Massachusetts. It costs about $12.50 to transport a thousand board feet of lumber from the southern states by rail to Pittsburgh, and $15 to Boston. Western lumber is now moving in increasing volume from the Pacific Coast, 2000 miles or more by rail, to the western Lake States at a cost of $17 or $18 per thousand board feet, and 7000 by sea through the Panama Canal to the North Atlantic ports at a cost of $14 or $15. Pacific lumber even goes inland by rail from Baltimore to Pittsburgh and Cincinnati. Obviously all this raises the price of lumber and hence of houses and other buildings. In 1920, more than 1,660,000 carloads of lumber were shipped by rail and water in the United States at a cost of over 250 million dollars. Even in the short period from 1914 to 1920, changes in the distribution of the lumbering industry added 30 per cent to the average length of the railway haul of lumber in the United States.

The change in the location of the chief lumber areas has caused new kinds of wood to spring into prominence. The following table shows how certain kinds derived from northern and eastern species have fallen off during the present century, while others derived from southern and especially western species have increased.

PRODUCTION OF LUMBER IN UNITED STATES
IN MILLIONS OF BOARD FEET

	White Pine	Yellow Pine	Douglas Fir	Oak	Poplar	Elm
1899	7.74	9.66	1.74	4.44	1.12	0.46
1909	3.90	16.28	4.86	4.41	0.86	0.35
1918	2.20	10.85	5.82	2.03	0.29	0.20
1922	1.38	11.50	6.83	1.61	0.27	0.14
Change in production, 1899–1922	−82%	+19%	+292%	−64%	−76%	−70%

The change in forest methods is well illustrated by the fact that the national forests in the United States increased from 46 million acres in 1899 to 167 million in 1909, while those of Canada rose from 700,000 in 1901 to 153 million in 1917. The need of a careful forest policy appears from the following annual averages for 1909 to 1918:

	Millions of Cubic Feet	Per Cent
Total wood cut in U. S. forests except for fuel	14,319	100
Wasted in the forest and at the mill	10,037	70
Available for use	4,282	30

Approximately 5 per cent of the wood available for use is lost in seasoning and still more in converting the raw lumber into finished products. Scarcely a quarter of the actual wood is finally used.

Enormous waste also occurs through forest fires due largely to the dry waste wood left when the lumbermen lop off the tops and branches of the trees. In the five years from 1916 to 1920, about 160,000 forest fires burned more than 56 million acres of land in the United States and caused a loss of 86 million dollars in timber alone, and probably a far greater loss in the destruction of the nitrogenous humus of the soil. The conservation policy of the United States and Canada is rapidly diminishing such losses. In addition to thus conserving the lumber supply and helping to steady the price, the forest reserve system prevents the washing away of the soil which is often a serious consequence when forest fires destroy the roots and small plants which hold the soil in place after the trees are cut. Another and growingly important benefit of forest reserves is that they provide wonderful opportunities for recreation. Each year, from a quarter to a half million non-residents are estimated to visit the Maine woods, and to spend there toward 50 million dollars. If those woods were permanent forest reserves, their value and permanence in this respect would be greatly increased.

The Relative Importance of Fisheries at Present.—Because fishing is one of the primary occupations like agriculture, mining, and lumbering, its importance is often over-rated. For every person classified by the United States Census in 1920 as a fisherman, the following numbers were engaged in other occupations:

Fishing	1	Domestic service	64
Lumbering and forest products	5	Trade	80
Mineral extraction	21	Agriculture	202
Professions	41	Manufacturing and mechanical industries	241
Transportation	58		
Clerical occupations	59		

The slight relative importance of fishing, which includes oystering, also appears in the fact that the fishermen are approximately as numerous as any one of the following groups: actors, dentists, draftsmen, peddlers,

candy makers, cabinet makers, stock herders, or fruit growers. Errand and messenger boys are more than twice as numerous, and nurses three times as abundant. The value of the fishery products of the United States is estimated by the Fishery Bureau as about 90 million dollars per year, including Alaska. This is more than the value in Japan or Great Britain, which normally stand next,* but is probably less than that of China (Fig. 132 and Table 22). Yet it is only about equal to the value of the sweet potatoes, kafir corn, or cotton seed raised in the country, and only one-seventeenth that of corn. During the year 1919, according to the census reports, the value of the fisheries

Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 132.—World Map of Production of Fish.

Each dot represents an approximate value of $1,000,000.

products was exceeded by that of corn, hay, wheat, cotton, oats, tobacco, apples, and barley, in the order named.

The Reasons for the Small Production of Fish.—Some of the chief hindrances to a greater use of fish are as follows: (1) The distance of the fishing grounds from home. Even the oysterman usually does his work at least a mile from home, whereas few American farmers have fields so far away. (2) The danger involved in seafaring. A noteworthy feature of the mortality statistics in the fishing countries of Iceland, Newfoundland, and Norway is the great excess of deaths of young men from 15 to 30 years of age compared with young women of the same ages. (3) The precariousness of the occupation. It is no light thing when a fishing boat sails several hundred miles to the Banks, and

* In Table 22 the value of the fishery products of France appears to rival that of the United States and Japan, but that is probably merely because the latest available French data pertain to the wartime period of inflated prices.

then searches for weeks without catching any appreciable supply of fish. The good years bring "prosperity and plenty," while the bad years bring "hardship and hunger." (4) The difficulty of preserving the product. Not only do fish spoil rapidly, but the fisherman cannot drive his animals alive to the railroad station and ship them to a well-prepared slaughter house as can the farmer. Nor can he suit his own convenience as to how many he will kill at a time. He must catch the fish when he finds them, and clean them, salt them, or otherwise preserve them at once. (5) This is one reason for another difficulty, namely the hardship of the fisherman's life. Such a life has indeed an attraction for many young men, and helps to produce the finest type of sailor, but the hardship causes many to shrink from it more than from most occupations.

These reasons, and others, join with the location of the fishes' food supply in causing a large share of the fishery products of the United States to consist of oysters, lobster, salmon, and other species caught in shallow water close to the shore. Even "deep sea" fisheries are conducted in the relatively shallow water over "banks" such as those of George's, Newfoundland, and the North Sea. Only in such places does the sunlight reach the sea bottom so that vegetation can grow and supply food for the fish or for their prey. This food supply increases in high latitudes presumably because dead organisms decay quickly in the warm surface waters of low latitudes, but are preserved a long time in colder water, so that in high latitudes the sea contains more floating food than in low. The difficulty of preserving fish in warm countries and the unwillingness of tropical people to exert themselves as do the New Foundlanders, for example, also help to cause fishing to be less common in low latitudes than in high latitudes such as Alaska and the Labrador coast.

The Possibilities of a Food Supply from the Ocean.—Although the ocean to-day probably does not supply 1 per cent of the food of the United States, it offers one of the greatest sources of increased supply. Some of the ways in which the vast undeveloped resources of the sea can be developed are as follows: (1) By developing people's knowledge and taste so that new kinds of seafood may be used. To a middle westerner it seems strange to find the following on one bill of fare in a small sea-grill in Boston, the greatest American market for fresh fish: cod, sole, flounder, halibut, scrod, mackerel, clams, bluefish, fresh salmon, crabs, butterfish, shrimps, lobster, oysters, swordfish, haddock, and finnan haddie. But the Bostonian has not yet learned to eat whale meat, shark, and the despised dogfish, although they are good food. (2) Modern methods of refrigeration make it far easier than formerly

to use the fish of warm latitudes. Although fish are not so abundant there as farther north, they exist in vast quantities, and the warm climate and relative absence of storms lessen the danger and hardship of the fisherman. (3) Another means of increasing the use of the sea as a source of food lies in helping the fish through the first part of their lives. For every fish that reaches the size of one's finger, hundreds or thousands of eggs and newly hatched fish are eaten by other animals. That is why in the banner year of 1919, for example, the United States Government not only distributed about 1200 million fish eggs to local hatcheries to be hatched under protected conditions, but distributed 4500 million fry and 150 million fingerlings, yearlings, and adults. Fish thus protected have a vastly greater chance of growing up than have those left to chance. Although fish hatcheries at present are of more value to inland waters than to the ocean, they represent a distinct tendency toward the control of the sea by man in somewhat the same way that he controls the land. Ages ago man lived on plants and animals that grew of themselves; now he lives on those that he himself raises. Where only one person could then get a precarious living in one square mile, two or three hundred can now provide for themselves abundantly. The leasing of oyster beds by the state, the licensing of lobster fisheries and the distribution of fish eggs are faint beginnings of the cultivation of the sea. Nowhere else, perhaps, is there a greater opportunity for man to increase his power over nature and obtain new supplies of food.

EXERCISES AND PROBLEMS

1. From Table 28 insert on a large map of the United States the name of the mineral industry standing first in each state and the number of thousand workers engaged in the industry. Shade the map in five colors according to the dominant industry: (1) coal, (2) petroleum, (3) iron, (4) other metals, (5) quarry products. Remember that in states like Maryland, Virginia, and Alabama the coal is all in the Appalachian portions. Find out what parts of Texas, Oklahoma, and California produce petroleum, and shade accordingly. Shade the rest of these states in accordance with the second mineral, as given in Table 28. Where the production is so small that no data appear in Table 28, shade for quarry products such as gravel and sand. Discuss the distribution of the five types of products.

2. Make a similar map for the mineral industries second in importance. Which type shows the greatest increase in area in this map compared with the first? Why? How does the number of people employed in the second industry compare in general with the number in the first? What state receives the same shading in both maps and why? How do the petroleum and coal areas in the two maps compare?

3. Make a map of the third most important mineral product. In how many states does the third industry employ enough men to be really important? In what states do all three of the main mineral industries belong to one type? On another map shade each of these states with a special color. What do you conclude as to

(*a*) the number of important mineral industries in any one state? (*b*) the relative location and extent of each of the three types—fuels, metals, and quarry products? (*c*) the centers of production?

4. On another set of maps of the United States insert in each state the number of persons engaged in each of the following mineral industries: (1) iron, (2) gold, silver, copper and quicksilver, (3) lead and zinc, (4) coal, (5) petroleum, (6) quarry products. Wherever two of the divisions given above are grouped together count half in each division. On each map shade the area where production is indicated. Point out which states are most important because of (*a*) the number of persons employed, (*b*) the amount of production as indicated in Table 27, and (*c*) the production in proportion to the population.

5. Discuss your own state in the light of Tables 27 and 28 and of the maps of the preceding problems.

6. Draw a map locating each of the forest regions of the following table which represents one of several ways of classifying American forests.

I. *Northern Region. Forest of the Past.* New England to Minnesota with Appalachian prong to Georgia. Chiefly coniferous—white pine, hemlock, etc. Reduced from 150 to 90 million acres, and from 1000 to 300 billion board feet.

II. *Southern Region. Forest of the Present.* New Jersey to Texas and southern Missouri. Chiefly coniferous—yellow pine; hardwoods plentiful in parts. Reduced from 220 to 150 million acres, and from 1000 to 500 billion board feet.

III. *Central Region. Farmer's Forest.* Southern New England westward and southwestward between Nos. I and II chiefly hardwood, largely cleared—oak, maple, walnut. Reduced from 250 to 130 million acres and from 1400 to 290 billion board feet.

IV. *Rocky Mountain Region. Forest of Distant Future.* Scattered areas mostly on high slopes. Chiefly coniferous—Western yellow pine, firs, spruce, and western hemlock. Reduced from 110 to 100 million acres, and from 400 to 300 billion board feet.

V. *Pacific Region. Forest of Immediate Future.* Among mountains. Chiefly coniferous—douglas fir, Western white pine, redwood. Reduced from 90 to 80 million acres, and from 1400 to 1100 billion board feet.

VI. *Alaska. Paper Forest.* Southern coast and along streams. Mostly spruce and hemlock. Not enough cut even for local use. Trees mostly rather poor but great source of pulp wood.

7. Write a comparison of two forest regions on the basis of all the data given in the text, in the preceding table, and in the following table.

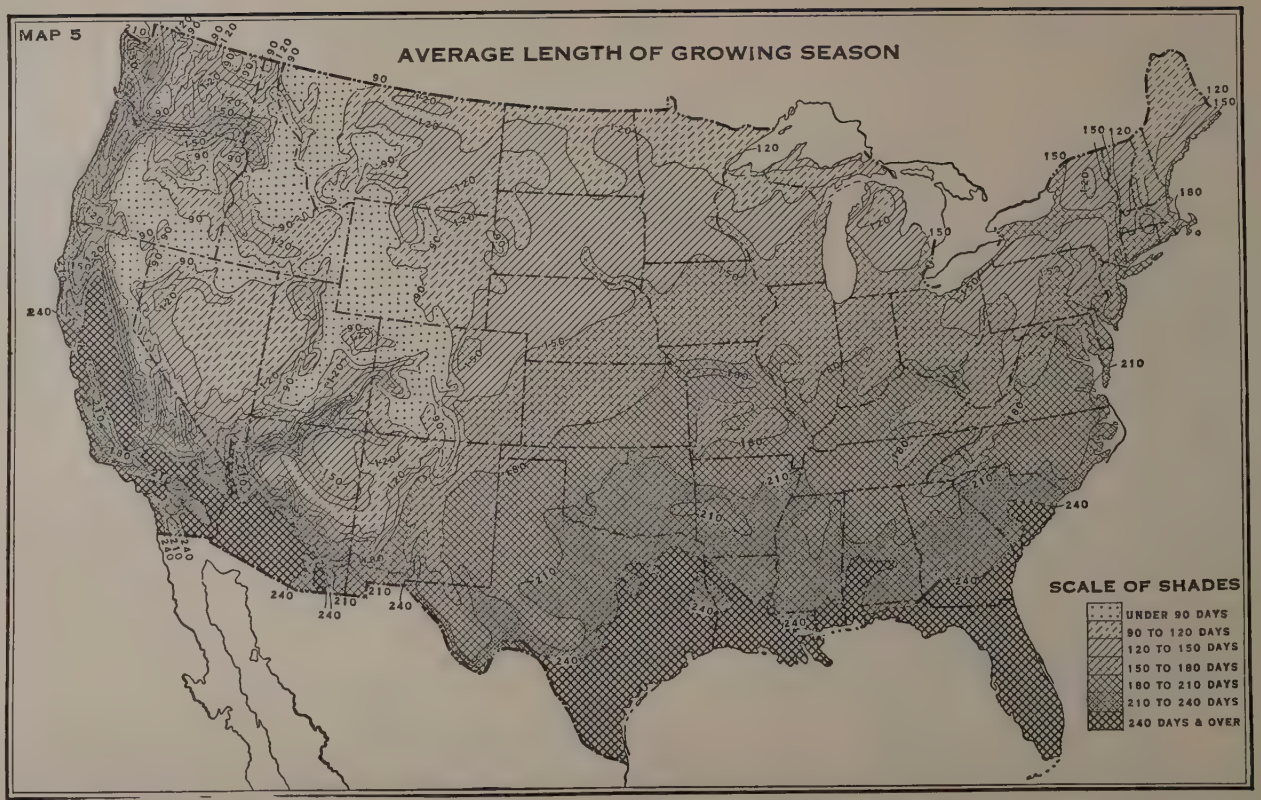
CHANGES IN PERCENTAGE OF SUPPLY OF TIMBER CUT IN UNITED STATES SINCE 1850

Year	Northeastern States	Lake States	Southern States	Pacific States
1850	54.5	6.4	13.8	3.9
1860	36.2	13.6	16.5	6.2
1870	36.8	24.4	9.4	3.6
1880	24.8	33.4	11.9	3.5
1890	18.4	36.3	15.9	7.3
1900	16.0	27.4	25.2	9.6
1910	9.9	12.6	44.0	18.6
1920	6.5	7.1	42.6	29.7

8. Discuss the lumber and firewood problem of your own locality, showing its relation to (*a*) forest regions, (*b*) changes in production and type of wood, (*c*) source of supply, (*d*) transportation, (*e*) prices. Consult local carpenters, contractors, and lumber dealers. Look up your state in the lumber table in the World Almanac.

9. From the table of National Forests in the World Almanac insert on a map the number of forests in each state and their area in thousands of acres. Explain how the distribution of National Forests is related to (*a*) the great forest regions, (*b*) rainfall, (*c*) relief, (*d*) date of settlement, (*e*) density of population, (*f*) recreation, (*g*) pasturage. Find out as much as possible about the National Forest nearest your home.

10. In the *Yearbook of Canada* or Colby's *Source-Book of the Geography of North America*, look up the mining, lumbering, and fishing industries of Canada. Compare them with the corresponding activities in your own state and in the United States. Adapt the problems of this chapter to Canada so far as possible and work them out, using Canada instead of the United States.



From Yearbook of the U. S. Department of Agriculture, 1918.

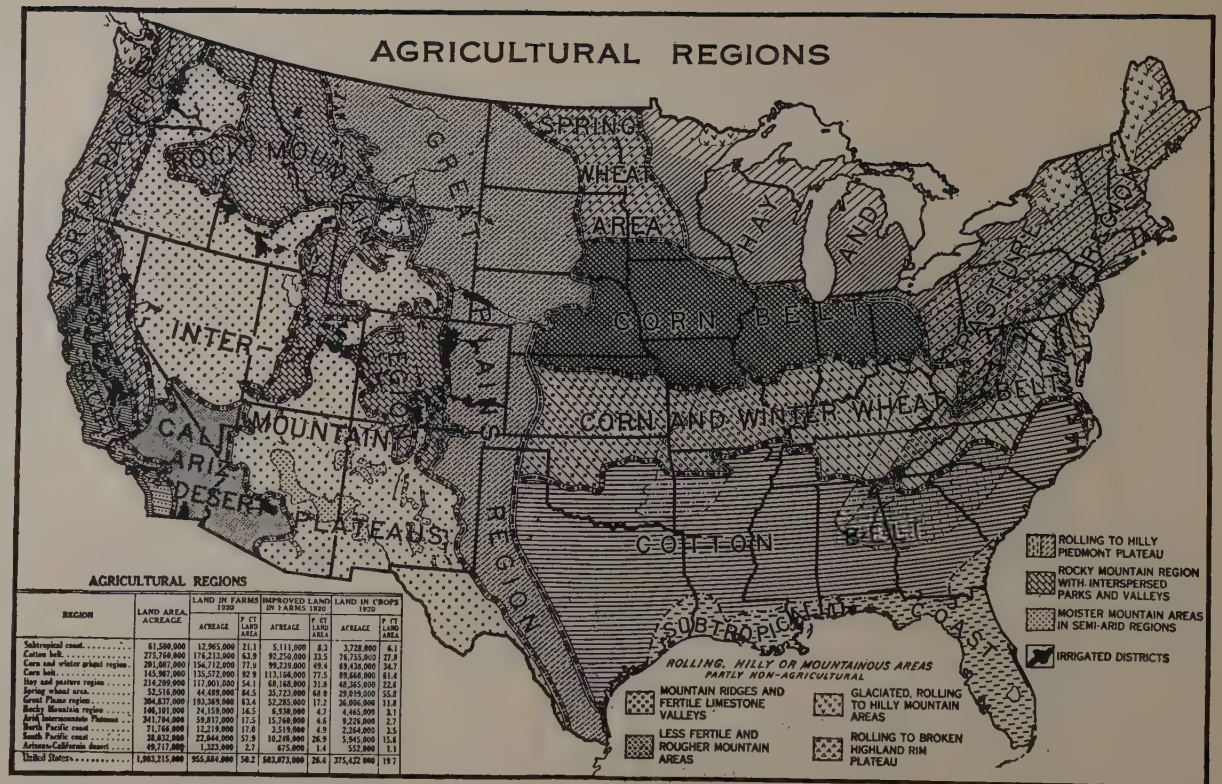
FIG. 133.—Length of Growing Season in United States.

CHAPTER XXIV

THE AGRICULTURAL INDUSTRY OF THE UNITED STATES

The Variety of Agricultural Types.—The farming industry of the United States and Canada is extraordinary in its variety of types (Fig. 134), in the varied degree to which it utilizes the land (Fig. 135), and in the degree to which the percentage of gainfully employed persons engaged in agriculture varies from place to place (Fig. 136). In some places the one-crop type prevails as among the potato farmers of Aroostook County in Maine. Elsewhere horticulture of a highly intensive type is found, as in the market gardens near the great cities, and at intervals along the Atlantic coast from Norfolk to Florida. Another type of horticulture prevails in the irrigated orchards and gardens of the West, especially on the farms of California where vegetables like asparagus and green peas reach a maximum development. In a small way the millions of people who have home gardens are also horticulturists. Of quite a different type are the animal farms. Some supply milk for the cities, while elsewhere the milk is made into cheese and butter, as in Wisconsin. The sheep and cattle ranches of the West represent still other types of animal farms. In addition to all these there are what we have called the allround farmers. They are most numerous in the fertile prairie states and Ontario, but are found wherever the intelligent and careful farmer takes pains to raise a diversity of products.

The Causes of Different Agricultural Types.—The great diversity of farming in the United States and Canada is due to many causes, including (1) the racial qualities, training, and energy of the farmers, (2) the soil, (3) the relief of the lands, (4) the climate, and its relation to the optima of plants and animals, (5) the distribution of insect pests, rusts, blights, and similar scourges, (6) transportation, and (7) the location and character of markets. When immigrants first come to America or move from one farming region to another, all but the most intelligent usually begin by trying to farm in the same way as at home. Thus the English when they first came to America thought that wheat and root crops were the most important products. The Germans introduced their own special methods of intensive farming which have persisted



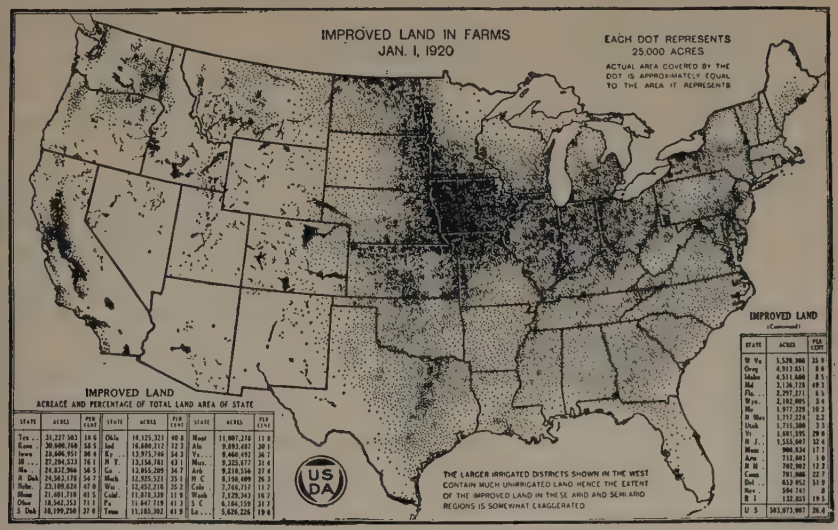
AGRICULTURAL REGIONS

REGION	LAND AREA, ACREAGE	LAND IN FARMS 1920		IMPROVED LAND IN FARMS 1920		LAND IN CROPS 1920	
		ACREAGE	P CT LAND AREA	ACREAGE	P CT LAND AREA	ACREAGE	P CT LAND AREA
Subtropical coast	61,500,000	12,965,000	21.1	5,111,000	8.3	3,728,000	6.1
Cotton belt	275,760,000	176,213,000	63.9	92,250,000	33.5	76,735,000	27.8
Corn and winter grain region	201,087,000	156,712,000	77.9	99,239,000	49.4	69,438,000	34.7
Corn belt	145,987,000	135,572,000	92.9	113,166,000	77.5	89,668,000	61.4
Hay and pasture region	214,299,000	117,901,000	54.1	68,168,000	31.8	48,365,000	22.6
Spring wheat area	52,516,000	44,489,000	84.5	35,722,000	68 0	29,015,000	55.8
Great Plains region	304,637,000	193,369,000	63.4	52,285,000	17.2	36,006,000	11.8
Rocky Mountain region	146,101,000	24,159,000	16.5	6,530,000	4.7	4,465,000	3.1
Arid Intermountain Plateaus	341,704,000	59,817,000	17.5	15,760,000	4.6	9,228,000	2.7
North Pacific coast	71,766,000	12,219,000	17.0	3,519,000	4.9	2,264,000	3.5
South Pacific coast	38,032,000	22,044,000	57.9	10,249,000	26.9	5,945,000	15.6
Arizona-California desert	69,717,000	1,323,000	2.7	675,000	1.4	552,000	1.1
United States	1,903,215,000	955,884,000	50.2	502,873,000	26.4	375,422,000	19.7

Courtesy of U. S. Department of Agriculture.

FIG. 134.—Agricultural Regions of the United States.

to an uncommon degree in southeastern Pennsylvania. When the Italians reach America they are apt to set out vineyards and to plant


IMPROVED LAND IN FARMS
JAN. 1, 1920
EACH DOT REPRESENTS
25,000 ACRES
ACTUAL AREA COVERED BY THE DOT IS APPROXIMATELY EQUAL TO THE AREA IT REPRESENTS
IMPROVED LAND
ACREAGE AND PERCENTAGE OF TOTAL LAND AREA OF STATE
IMPROVED LAND
(Continued)
USDA
THE LARGER IRRIGATED DISTRICTS SHOWN IN THE WEST CONTAIN MUCH UNIRRIGATED LAND HENCE THE EXTENT OF THE IMPROVED LAND IN THESE ARID AND SEMI ARID REGIONS IS SOMEWHAT EXAGGERATED

Courtesy of U. S. Department of Agriculture.

FIG. 135.—Improved Land in Farms in the United States, 1920.

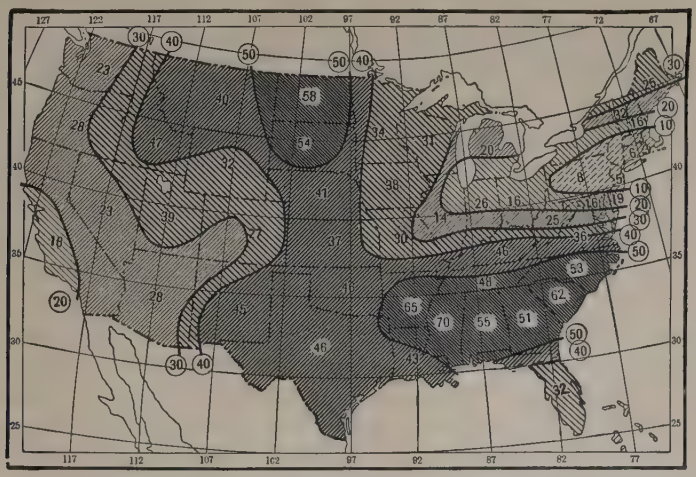


FIG. 136.—Percentage of Gainfully Employed Persons Engaged in Agriculture in the United States, 1920.

a great variety of trees and crops in a single field, a practice which is common where irrigation prevails. People from Scandinavia usually

want to make dairy cattle a main part of their farming, while the Mexican thinks that a cattle ranch is the only real farm. When people move from one part of the country to another the same thing often happens. For example, not a few farmers, in spite of the advice of previous settlers, have tried to raise grain without irrigation on the apparently fruitful plains of Arizona. They saw an abundance of wild grass and bushes and did not realize that such plants can thrive with far less rain than ordinary crops.

The Adaptation of Farming to Geographical Conditions.—An immigrant farmer who brings to America his old ideas of farming soon finds that he must adapt his methods to the new surroundings. One adaptation depends on the farmer's own health and energy. In a northern region such as Maine or Minnesota he is stimulated to work. In the South the fair Nordic from northern Europe has generally supposed that he cannot work vigorously in the sun. He tends to rely on colored labor, but if he is not sufficiently competent to be an employer, he may sink to the grade of a poor white and suffer from competition with the colored man. Another great factor in determining the type of farming is the soil and relief. The abandonment of New England farms is partly a matter of relief, but perhaps equally of soil. The climate of Massachusetts is only a little less favorable for agriculture than that of Illinois, but the levelness of Illinois, and the depth and richness of the soil, give that state an enormous advantage. The climate also makes a great difference in the methods of farming and the type of crop. It would be foolish for a Minnesota farmer to try to raise cotton, and it does not pay for the Georgia farmer to raise much wheat, simply because no crop will thrive when the climate departs too far from its optimum. Insects or other pests may greatly modify certain forms of agriculture. For example, the cotton raisers of Texas have been obliged to depend more than formerly upon other crops because the boll weevil has injured the cotton so much. The cotton farmers of Texas have few large truck gardens partly because transportation to the great markets in the North Atlantic states is more expensive than from Florida or Virginia.

Farming in Typical Parts of the United States and Canada.—(1) *The New England Type.*—A good way to understand the interplay of all the various factors is to consider the agriculture of certain typical regions. A relief map shows that New England, northern New York, and most of southeastern Canada form a fairly rugged but not highly mountainous region. A map of the length of the growing season (Fig. 133) shows that in this region the growing season is comparatively short, for it diminishes in length not only from south to north, but from west to east. Other maps, such as those for corn (Fig. 8), wheat (Fig.

2), vegetables (Fig. 92), and oats, barley and others as given in the *Geography of the World's Agriculture* or the *Graphic Summary of American Agriculture* show that the production of crops in this region is relatively small. Throughout most of New England and the Maritime Provinces the farmers rely largely on root crops, especially potatoes, and upon hay and cattle.

Although there are great differences from place to place, the general character of New England agriculture may be judged from a typical area such as Worcester County in Massachusetts. Some statistics for this are given in the table on page 352. If these are studied carefully and compared with similar statistics for other parts of the country and for the reader's own region, they shed much light on how farming varies from region to region in response to the geographical conditions. The table is divided into four parts: (I) the farm, (II) the farmer, (III) the products, (IV) the expenses. As to the farm, Col. B shows that the average size in Worcester County is 84 acres, which is small compared with western farms but fairly large compared with those of the South or near the cities. Because of the ruggedness of the land and the poor rocky quality of the thin soil, only about 35 per cent (Col. C) of the land is improved, which means that only 30 acres are actually cultivated while 54 are in woodland and unimproved pasture. The value of the average farm in Worcester County in 1919 was $7800 or $36 per acre including the unimproved land. If the improved land alone were taken, this value would rise much higher. Since Worcester County is near the large cities of Worcester and Boston, its farms are smaller and the values greater than the average for New England.

The second part of the table shows that 70 per cent of those who cultivate the farms of Worcester County are native whites, chiefly the descendants of early immigrants from Great Britain. The number of colored farmers is negligible (Col. G), but about 30 per cent of the farmers are foreign born, which means that foreigners are taking up New England farms quite rapidly. New England is often spoken of as a region of abandoned farms. These figures suggest that the abandonment is only temporary, and that as the original farmers of British descent move away, their place is gradually being taken by newcomers, mostly from other parts of Europe. Practically all the farmers, both native-born and foreign, own their own farms, for only 6 per cent of the farms are operated by tenants. (Col. H.) This is a good sign, for the man who owns his farm is more likely to be a responsible and desirable citizen than one who rents.

As to products, the average value of all crops per farm in Worcester County in 1919 was $1410 (Col. I). This is small compared with the

THE FARMS OF TEN TYPICAL SECTIONS OF THE UNITED STATES, 1919

Type of Region.	A. County Chosen as Example.	B. I. The Farm. Average Size in Acres.	C. I. The Farm. Per Cent of Improved Land per Farm.	D. I. The Farm. Value of All Property per Farm.	E. I. The Farm. Average Value of Land per Acre.	F. II. The Farmer. Per Cent of Native White Farmers.	G. II. The Farmer. Per Cent of Colored Farmers.	H. II. The Farmer. Per Cent of Farms Operated by Tenants.
New England...	Worcester, Mass....	84	35	$7,800	$36	70	0	6
Truck Area	Camden, N. J	49	78	8,600	92	64	2	23
Cotton Belt	Washington, Miss.	34	73	6,200	146	6	93	95
Eastern Plateau.	Clay, Ky.....	44	36	1,900	15	98	2	39
Corn Belt.....	McLean, Ill	166	96	62,000	322	91	0	58
Wheat Belt	Cass, N. D.....	421	94	41,000	76	61	0	40
Dry Plains.....	Kit Carson, Colo...	500	32	16,800	26	88	0	23
Cattle Country..	Grant, N. M	870	7	16,000	8	83	0	23
Irrigation Type.	Utah, Utah	98	43	9,900	72	85	0	10
Fruit District...	Fresno, Calif	148	51	34,000	197	50	7	15

Type of Region.	I. III. The Products. Value of All Crops per Farm.	J. III. The Products. Value of All Crops per Acre of Improved Land.	K. III. The Products. Value of Grain per Farm.	L. III. The Products. Value of Hay and Forage per Farm.	M. III. The Products. Value of Fruit and Vegetables per Farm.	N. III. The Products. Total Value of All Animals per Farm.	O. III. The Products. Value of Dairy and Poultry Products per Farm.	P. IV. The Expenses. Average Expenditure per Farm for Labor.	Q. IV. The Expenses. Average Expenditure per Farm for Fertilizer.	R. IV. The Expenses. Average Expenditure per Farm for Feed.
N. England	$1410	$48	$ 84	$762	$558	$1340	$1225	$430	$48	$667
Truck ...	3260	85	325	253	2780	760	346	588	409	332
Cotton	1375	55	115	55	18	520	52	56	1	54
E. Plateau	645	41	386	73	137	364	126	18	3	26
Corn.....	6240	39	5680	420	125	2560	1050	665	11	265
Wheat.....	6650	17	4800	1200	610	2600	45	1250	4	171
Dry Plateau	2250	14	1650	54	59	2125	36	216	0	180
Cattle.....	1080	18	620	300	140	7700	236	306	0	243
Irrigation...	2340	56	423	700	610*	1272	274	244	4	117
Fruit.....	5800	77	260	755	4750	1370	350	1190	29	300

* Not including sugar beets.

farms of almost any other type or almost any other part of the country. The value per acre, however (Col. J) is about medium. Cols. K to M show the kind of crops. The New England farms raise very little grain, largely because of the relief and soil, but mainly because dairy products,

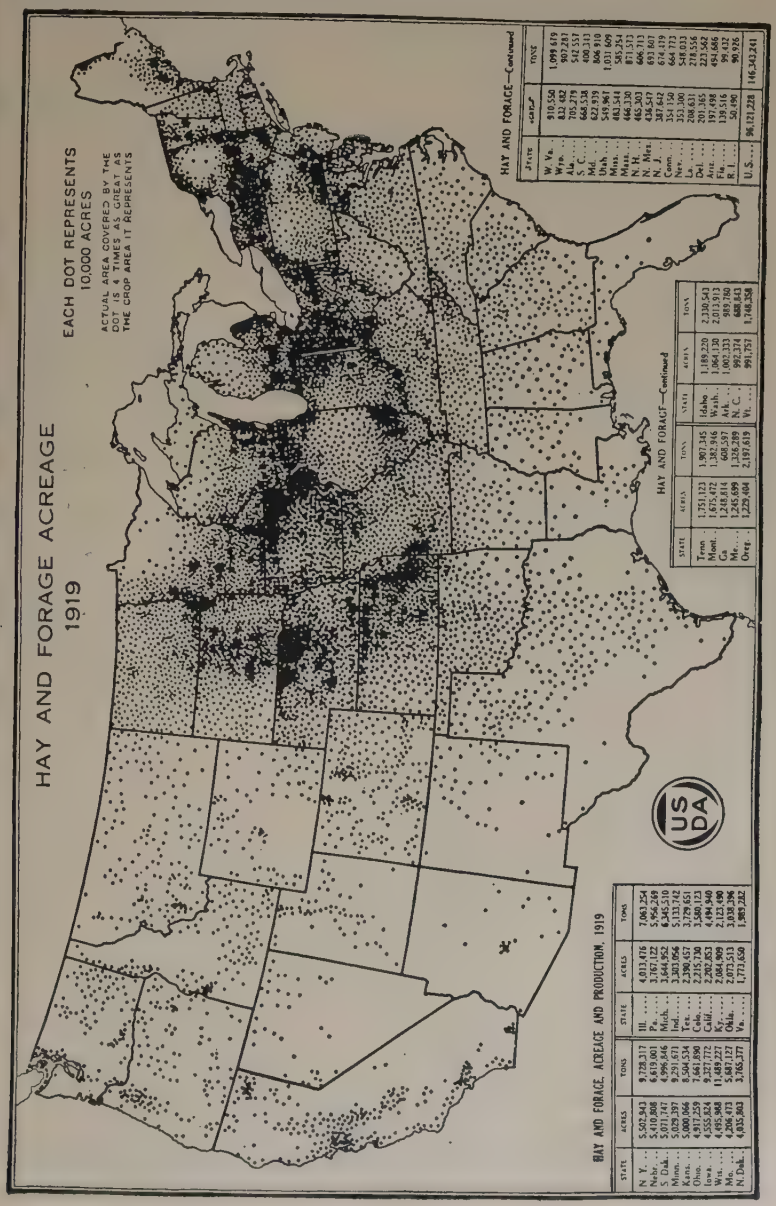

HAY AND FORAGE ACREAGE
1919
EACH DOT REPRESENTS
10,000 ACRES
ACTUAL AREA COVERED BY THE DOT IS 4 TIMES AS GREAT AS THE CROP AREA IT REPRESENTS
USDA
HAY AND FORAGE, ACREAGE AND PRODUCTION, 1919
HAY AND FORAGE—Continued
HAY AND FORAGE—Continued

Fig. 137.

vegetables, and fruit are more profitable. More than half the crops consist of hay and forage (Fig. 137) which are fed to cattle, while a third consist of fruit and vegetables, especially potatoes. In Col. N it appears that the animals on the farm are almost as valuable as the crops raised in a single year. How much new value is produced by the animals each year in the form of the young that are raised or of old animals that are killed for meat or other purposes cannot be stated definitely, but we may roughly call it one-fourth of the total value. Since dairy and poultry products yield almost as much as all crops combined, it is evident that animals in one form or other are the main source of income.

The approximate income of these New England farmers may be estimated thus: in Col. I, $1410, a fourth of Col. N, $335, Col. O, $1225, and perhaps $400 to represent the rental value of the farmer's house, provided he owns it without a mortgage, and the food which he and his family consume without keeping a record of it,—a total of $3370. From this we deduct $430 for labor, $48 for fertilizer, $667 for feed for animals, and perhaps $700 for hay and forage included in Col. I, but consumed on the farm. Thus in 1919, a year of very high prices, the average income, even in a relatively prosperous region like Worcester County, was only about $1500.

This picture of the New England farm and its products needs to be supplemented by studies of special sections such as the rich tobacco farms of the Connecticut Valley, the potato farms of Aroostook County, and the truck farms and market gardens that will be considered later. Nevertheless, in a general way it represents the average New England farmer, and shows that he spends most of his time in raising hay and forage and in taking care of his cattle and dairy products.

(2) *The Truck Areas.*—Truck farms and market gardens are especially good examples of the effect of a large market. They cannot thrive unless within quick and easy reach of large cities where people do not raise their own vegetables. Camden County, New Jersey, is a good example because of its nearness to Philadelphia. The table shows that the average Camden truck farm is little more than half as large as the New England farm in Worcester County. But a much larger proportion, 78 per cent, is improved so that the actual cultivated land is 38 acres in place of 30 for the Worcester County farms. The value of the farm is a little higher than in Massachusetts, while the nearness to the great city makes the value per acre nearly three times as great. Here, even more than in New England, foreign-born farmers are taking up the land, for only 64 per cent are native whites, 2 per cent Negroes, and the remaining 34 per cent foreign-born. Many of the foreign-born

and some of the whites rent their farms, for 23 per cent are operated by tenants. Col. I suggests that it is more profitable to run a truck farm near a great city than to run a dairy farm a little farther away. When the income is calculated, this suggestion is confirmed. Even though large deductions must be made for labor, fertilizer, and feed, the net income in 1919 was over $2500, about two-thirds more than that of the New England dairy farmer. The truck farmer pays little attention to grain and hay, for the two together yielded him only about $600 in 1919, while fruit and especially vegetables brought nearly $2800. He is also a great user of fertilizers. The map of the amount spent for fertilizers (Fig. 19) shows how largely these are required in the truck areas near the cities and in certain special places like the tobacco farms in the Connecticut Valley and the Carolinas, where the crops make great demands on the soil and there are relatively few animals to supply manure.

(3) *The Cotton Belt.*—The Cotton Belt includes the southeastern states shown in Table 15, as raising appreciable quantities of cotton, but in Texas only the eastern part of the state should be included. The farms in a typical county in Mississippi average only 34 acres in size, but have a fairly high value per acre. The percentage of native white farmers is extremely small, the great majority of the farmers being negroes, practically all of whom, as well as some of the white farmers, are tenants. The total annual value of all crops is about the same as in Massachusetts, but only a trifle is added by animal products. The average annual income from all sources aside from cotton amounts to only about $350, so that about three-fourths of the entire income is derived from cotton. Evidently one-crop farming is here carried to great extremes. This fact and the prevalence of tenancy indicate that the social and economic conditions are serious. The ravages of the boll weevil and other cotton pests deplete the cotton farmer's income considerably.

(4) *The Eastern Plateau.*—North and northwest of the Cotton Belt, the Eastern or Allegheny Plateau, as we have seen, shelters a relatively small and peculiar group of farmers. The percentage of native white farmers is larger than in any other part of the United States. The value of their small farms is so extremely low that it would take 33 farms in Clay County, Kentucky, to be as valuable as one farm in McLean County, Illinois. This fact brings out with great force the effect of relief and soil. Clay County has a climate differing only a little from that of central Illinois. It lies near great markets such as Cincinnati. If its white farmers inherit any less ability than those of the neighboring states, this is due largely to the selective power of their environment.

The main trouble is that the ruggedness of the land produces the conditions that tend to retard progress.

(5) *The Corn Belt.*—Only 200 miles north of Clay County one is in the midst of the Corn Belt, the richest agricultural section of the United States and perhaps of the world. The Corn Belt includes the prairie plains from Ohio westward through Illinois, Indiana, Iowa, and Nebraska (Fig. 134). The general levelness not only helps to make the soil deep and fertile, but facilitates transportation, favors the use of machinery, and causes the erosion of the fields to be small. The Corn Belt also has the advantage of an unusually good climate both for men and crops. The importance of agriculture in this belt is shown by the fact that four states have over 90 per cent of their total area in farms while Iowa has over 94 per cent.

Contrast McLean County in north central Illinois with Clay County in the Plateau only 300 miles away. The size of the average farm in McLean County is 166 acres, which means that most farms still consist of a quarter section, or a quarter of a square mile, which was the size of the farms given by the Government to the original settlers. Of these 166 acres, 96 per cent are improved, which is an extremely large percentage. The average farm in 1919 was worth $62,000 or $322 per acre, so that the farmer, who is almost always a native-born white, is a comparatively rich man.

Column H indicates the beginning of an unfortunate state of affairs. In the Corn Belt, as in the South (Fig. 20), tenancy has become common. The land has yielded so abundantly and is located so near some of the great consuming centers such as Chicago and St. Louis that the farmers have grown rich. Many have retired and settled in the towns. Their sons have gone to college or to the city, and do not care to continue working on the farm. So the farms are rented to tenants. Some of these are people from the East, others are foreign immigrants, and some are people who have lately become interested in farming, or who have been unfortunate and have had to sell their farms. In most cases the tenants do not cultivate so carefully as the owners, and do not feel so much responsibility for the general good of the community. Hence the growth of tenancy, although a sign of prosperity, is also a warning of danger.

In the section of the table labeled "Products," the value of all crops in McLean County is seen to have averaged $6200 per farm in the census year 1919. Although that was a year of high prices, the income from crops on farms in the better part of Illinois always averages large. The value per acre, $39, is not particularly high, to be sure, for the farmer cannot cultivate so large an area very intensively, but even with extensive cultivation the total income is high. Since

these Corn-Belt farmers each year raise animals which are worth perhaps a quarter or more of the value given in Col. N, and since their hay is worth $420 per farm, their fruit and vegetables $125, and their dairy products $1050, the average farmer in 1919 had an income of about $2200 per year aside from grain. Since 44 per cent of the land devoted to grain is sown with crops other than corn, it is evident that even if the corn crop should fail entirely the farmers would still have a good income. In other words, an analysis of a typical county in the Corn Belt indicates that although corn is the chief crop, it furnishes decidedly less than half the yearly income. The good Corn Belt farmers practice all-round agriculture in an almost ideal climate with an almost ideal soil, and with unsurpassed facilities for transportation. They are correspondingly safe, prosperous, and contented.

(6) *The Wheat Belt.*—The Wheat Belt, as we have seen, is divided into two sections (Fig. 82). Cass County, North Dakota, the example in the table, shows a marked contrast to the Corn Belt. The farms are twice as large but the total value per farm is only two-thirds as great, and per acre only a quarter as great as in Illinois. The percentage of native white farmers is much less, there being a large number of people from northern Europe. The percentage of farms operated by tenants, though still large, is only two-thirds as great as in McLean County. Inasmuch as the land is level the percentage of improved land is about as great as in the Corn Belt. The total income from crops in the Wheat Belt is greater than from the Corn Belt farms, but inasmuch as there is very little from dairy and poultry products the total income from all sources is less. A careful study of this particular example shows that the crops are not so well balanced as in the Corn Belt. About 67 per cent of all the land devoted to grain, or an average of 182 acres for each farm, is in wheat, and this one crop provides about half the farmer's income. Animals provide perhaps a tenth; vegetables, chiefly potatoes, another tenth; and hay and forage two-tenths. The average production of wheat is only 7 or 8 bushels per acre compared with 17 or 18 for the same product in many of the Corn Belt counties. This illustrates the extent to which agriculture in the Wheat Belt not only tends toward the one-crop type but is extensive rather than intensive.

An interesting feature of the Wheat Belt is seen in Fig. 138. The United States Department of Agriculture makes careful estimates of the yield per acre when all products are taken together and each is given a weight proportional to the area devoted to it. Such estimates are made for each state each year. Fig. 139 shows the number of times by which the best year from 1910 to 1919 exceeded the worst year. For example, in Pennsylvania, as appears in Table 21, the average crop yield for

the worst year of this period was 91, while for the best year it was 110, or 1.2 times as much. In Illinois, in the heart of the Corn Belt, the

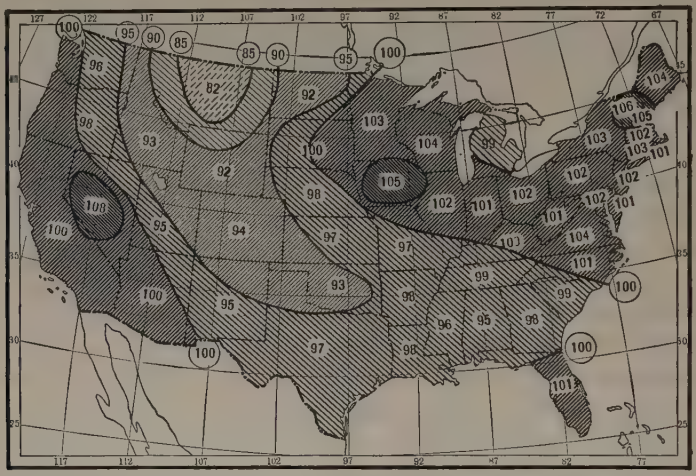


FIG. 138.—Relative Productivity of the Land in the United States, 1910–1919.

worst year had an average crop yield of 80 and the best of 118, or 1.5 as much. As soon as the ninety-fifth meridian is reached there is a great

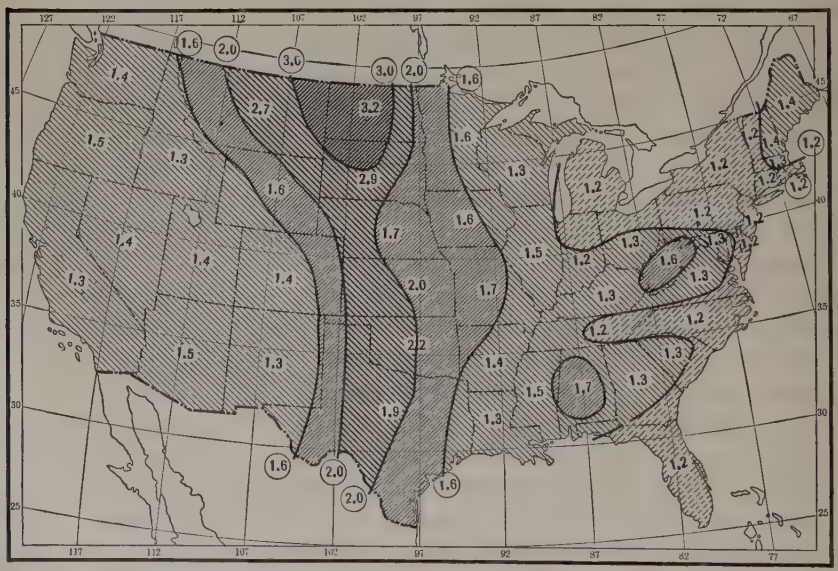


FIG. 139.—Relation between Average Yield of Crops per Acre in Best and Poorest Years from 1910 to 1919.

increase in the contrast between the best and the worst years. In North Dakota, the worst year had a yield of 43, the best of 142, or 3.3 times as much. In the entire belt from North Dakota to Texas the variability of the crops from year to year is much greater than in any other part of the country. Farther east the rainfall is sufficient so that a moderate drought does much less damage than in the Wheat Belt. In the dry regions of the West, irrigation insures a rather uniform yield of crops. The most important parts of the Wheat Belt, however, lie along the border line between the well-watered east and the irrigated West. Even a slight diminution in their 20 or 30 inches of rainfall affects the crops seriously. Moreover, in the North a cold winter may have a harmful effect. Thus while the farmers of the Dakotas and the other states in the same longitude have large incomes in relatively good years, they are more likely to suffer serious reverses than almost any other set of farmers in the United States.

This variability of the crops in the Wheat Belt is apparently connected with the fact that great farmers' political movements tend to arise or at least to become strong in the tier of states from North Dakota to Texas. One of these was the Grange, which was founded in 1867 for educational purposes. In 1873–1874, when poor crops impoverished the farmers on what was then almost the western frontier, the Grange undertook all sorts of cooperative schemes and entered politics. Later, about 1889, a similar movement under the name of the Farmers' Alliance reached its greatest strength in the same regions. It developed into a so-called non-partisan movement generally known as the Populist Party. Again during the Great War a similar organization known as the Non-Partisan League grew up in North Dakota where the great fluctuations in the yield of the crops helped to stir up the farmers to try cooperative schemes of all kinds. This movement, like its predecessors, failed to accomplish its immediate purpose, but in 1921–1924 the Agricultural Bloc, a coalition of Congressmen representing the agricultural states, particularly those of the Wheat Belt, exercised great influence on legislation. Other factors played a part in all these movements, but it is significant that they attained their greatest strength where variations in the crops cause the farmers to shift most rapidly from prosperity to poverty and back again.

(7) *The Dry Plains.*—The dry plains at the eastern base of the Rocky Mountains are transitional between the Wheat Belt and the typical cattle country. The large part played by grain and especially wheat shows that this region is like the Wheat Belt in many respects. The size of the farms and the relatively large value of the animals compared with the annual value of the crops indicate greater aridity than

in the Wheat Belt, and make the dry plains farms like those of the cattle region in many respects. (Fig. 138.)

(8) *The Cattle Country.*—The cattle country comprises great areas in the dry parts of the West among and beyond the Rocky Mountains. The actual number of cattle is, of course, far larger in the states farther east, but in proportion to the population, as is shown in Table 19, the number is greatest in the cattle country. The cattle ranches by their very nature must be of large extent. Those of Grant County in New Mexico average twenty-five times as large as the cotton farms in Washington County, Mississippi. Only a very small part of the land is improved and the value per acre drops to $8, or about a fortieth the value in the Corn Belt. A marked feature of this part of the country is the large percentage of native white farmers and the comparatively small number of tenants. The distribution of income is favorable. Although the average value of all crops was only $1080 in 1919, dairy and poultry products yielded $236, and cattle probably yielded in the vicinity of $2000. It should be noted, however, that because of the scanty rainfall a slight diminution in precipitation causes many cattle to perish, especially the calves, or more often, leads the farmer to sell his cattle when they are in poor condition and do not bring a good price.

(9) *The Irrigation Type.*—Along the western border of the Dry Plains, and interspersed among the ranches of the Rocky Mountain Cattle Country, and scattered here and there over all the dry region of the United States as far as California are great numbers of irrigation communities. Among all the types of farming in the United States the irrigation type perhaps approaches closest to the ideal so far as concerns its dependence on a variety of products, its certainty of good crops each year, and its general freedom from the droughts or wet spells which are usually the farmers' difficulties. Making the usual allowance for animals, the income of an irrigated farm in Utah County, Utah, in 1919 amounted to over $300 from animals, over $400 from grain, $700 from hay and forage, $600 from fruit and vegetables, a sum which rises higher if sugar beets are included, and nearly $300 from dairy and poultry products. The relatively small expenditure for labor, $243, indicates that the farmers and their families do most of the farm work themselves. They spend practically nothing for fertilizer because the soil is rich and new, and little for feed, since they raise all sorts of hay and grain at home. Inasmuch as an artificial water supply makes the irrigation farmer largely independent of rainfall, while the abundant sunshine and the rich soil of the dry regions assure him the other requisites for good agriculture, he can count on steady prosperity. Tenancy is

rare and the percentage of native white farmers high. Perhaps this combination of many favorable conditions is one reason why the average child in Utah is in school more regularly and persistently throughout a long school year than in any other state in the Union.

(10) *The Fruit Districts.*—The fruit districts of the United States are very irregularly scattered. They include the grape, prune, and orange districts of California, the orange groves of Florida, the grape

FIG. 140.—Percentage of Cropped Area (Solid Bars) and of Value of All Crops (Dotted Lines and Cross Bars) Represented by Individual Crops in the United States in 1919.

farms east of Lake Michigan and on the New York shores of Lake Ontario, the peach orchards in New Jersey, and the apple orchards of Oregon, New York, and New England. Therefore, Fresno County in California, the example here given, does not represent the general condition so well as do our other examples. On the whole, however, the other fruit-raising districts resemble those of Fresno in having farms of moderate but not excessive size and relatively high value. They are operated by the owners with relatively few tenants, but in most of the

fruit districts the number of native white farmers is greater than the 50 per cent of Fresno County. Allowing one-fourth (Col. N) for the value of young animals raised each year, a Fresno fruit farmer in 1919 received an income of about $1750 from various minor sources and $4750 from fruit and vegetables. On many of the Fresno farms, grapes form by far the larger part of the products. Here, as in many other fruit farms, the one-crop type of agriculture is rather strongly developed. It is less dangerous here, however, than in the Wheat Belt for example, since abundant facilities for irrigation prevent the yield from varying so much as in non-irrigated regions. In the East, a failure of the apple crop, such as occurred in New England in 1921, is a serious matter for the fruit farmer. Nevertheless, the fruit farmers all over the country are unusually prosperous. The high proportion of intelligent men among them is one reason why cooperation is unusually well developed.

Taken as a whole, the agriculture of the United States stands on a peculiarly firm basis. It is so varied that no probable condition of weather or any other natural disaster is likely to throw the whole country into distress. The crops in one region may fail, but those in others are almost sure to be good. Railroads and other facilities of communication are so well developed that only in a few areas like the Allegheny Plateau are the farmers either unable to market their crops fairly cheaply and promptly or to bring in supplies and go out to find work elsewhere when the crops are poor. In addition to all this there are few countries where scientific agriculture is progressing more rapidly under the guidance of a great national Department of Agriculture and of large numbers of Agricultural Colleges and Experiment Stations. Farming will always be the most important of all occupations, for it provides the food and raw materials to support the other major industries. The United States is fortunate in having such highly developed and successful agriculture.

EXERCISES AND PROBLEMS

1. On a map of the United States locate the ten counties given in the table on page 352 (Farms of Ten Typical Sections of the United States). Shade the areas which you are sure belong to each of the ten types of farming. Explain which types form solid belts or areas and which are scattered. In which parts of the country are several types intermingled? Explain why and how.

2. Study the agriculture of your own region. From the State Supplement of the Statistical Abstract of the United States make for your own county and one other county not far away a table like that on page 352. How does your county compare with the other? With the nearest of the ten examples given in the text? With the one in the text most like your own? Write an account of the agriculture of your county modeled on the accounts of the various regions in the text.

3. Investigate the changes in the use of the land in your state since 1850. Find in the State Supplement of the Abstract of the Census a table showing the per cent of improved land in farms. From this draw a graph showing the changes. Draw another graph showing the increase in population since 1850. Compare the two and explain the reasons for whatever differences you find.

4. Let a group of students cooperate in preparing a table with the following headings to illustrate the agricultural conditions of your own state compared with those of other states.

1	2	3	4	5	6
Own State.	A state with decidedly different temperature conditions.	A state with decidedly different rainfall conditions.	A state with similar climate but decidedly different relief.	Leading state in each agricultural condition.	Most backward state in each agricultural condition.

From the tables at the back of this book insert in your table the necessary names and figures to show the conditions set forth in Tables 2 A, 8 C, all columns of Tables 10, 15 to 21, 33 and 34.

Let each student write an account of the differences between his own state and the others in certain respects, and explain the reasons for those differences. Bring all the accounts together into a well-rounded comparison of your state with others. Make maps to illustrate the account wherever it seems desirable.

5. Study the problem of how the growing population of the United States can be supported. Experts estimate that the United States will probably have 150 million people by 1950 and 185 million by 2000 A.D. Practically all of our good and easily used land is now included in the 500 million acres reckoned as improved. How shall we support another 70 or 80 million people? Try to decide which of the following methods of adjusting the food supply to the growing population is being used now and is most likely to be used in the future. Decide which of the facts numbered I to XII below bear on the possibilities lettered A to F, and what tendencies they indicate.

POSSIBLE METHODS OF GETTING FOOD FOR MORE PEOPLE

A. *Reclaim good lands.*—(1) 30,000,000 acres highly fertile irrigable land; (2) 60,000,000 acres of drainable swamp land not quite so good. (Expensive, for the cheaply reclaimed lands are already irrigated or drained.)

B. *Cultivate poor lands.*—(1) Best half (80,000,000 acres) of cut-over and forest lands. (Easily reclaimed but would probably yield only two-thirds as much per acre as present cultivated lands); (2) all (50,000,000 acres) of unimproved pastures of East and dry-farming lands of West. (Easily reclaimed but probable yield per acre only 0.4 present average.)

C. *Increase yield per acre* to German or even Belgian standard wherever possible. (Table 12.)

D. *Cease using land for pasture.*—Feed animals in the barn, thus freeing improved pastures for crops, doubling their capacity to produce food, and practically adding 37,000,000 acres of good land.

E. *Change our diet.*—Substitute dairy products and vegetable oils for much of the meat now consumed. On the basis of calories, meat now supplies 23 per cent of the food of the United States, milk and dairy products 16 per cent, and vegetable products 60 per cent. The vegetable products are raised on only one-fifth of the

improved land, while food for animals requires nearly four-fifths. The per capita consumption of meat (including poultry and lard) is about 170 pounds in the United States, 100 in Germany (before the war) and 4 in Japan. Reduction of meat consumption to a level between those of Japan and Germany might permit a doubling of the population even with present acreage of improved land and present methods of agriculture.

F. *Reduce the exports of food and increase the imports.*

FACTS BEARING ON TRENDS IN LAND UTILIZATION AND SUPPLY OF FOOD

I. Average yield of chief crops in the United States (bushels per acre).

Crop	1870–1894	1895–1919	Crop	1870–1894	1895–1919
Corn.....	25.0	25.0	Buckwheat...	15.3	18.8
Wheat.....	12.3	14.2	Potatoes	79.5	91.5
Oats.....	26.8	30.3	Hay (tons)...	1.21	1.43
Barley.....	22.2	25.0	Cotton (lbs.).	174.9	181.8
Rye.....	13.1	15.6			

II. Pounds of meat consumed per year per person in urban versus rural districts, 1920.

Region	Urban	Rural	Region	Urban	Rural
North Atlantic States.....	167	175	South Atlantic States...	158	172
East North Central States.	177	196	South Central States....	178	182
West North Central States.	181	213	Western States.....	178	188

III. Percentage of urban population.

1790..3.3	1820..4.9	1840.. 8.5	1870..20.9	1900..32.9
1800..4.0	1830..6.7	1850..12.5	1880..22.7	1910..38.7
1810..4.9		1860..16.1	1890..29.0	1920..43.8

IV. Number of cattle, sheep, and swine per person.

1880..2.15	1900..1.63
1890..2.35	1910..1.87
1920..1.77	

V. From 1909 to 1919, under the stress of the demand for more food during the war, the land in crops increased about 55,000,000 acres, of which about 30,000,000 was improved pasture land, and only 25,000,000 was land previously not improved.

VI. The eastern, long-settled parts of the United States show a notable and wide-

spread decrease in farm land from 1910 to 1920, but an equally marked increase of land in crops. In other words the farmers are giving up the poorer lands and cultivating the better lands more carefully.

VII. The exports of meat from the United States amounted to 17 per cent of the production from 1896 to 1905, and to 12 per cent from 1916 to 1920. The exports of wheat averaged 31 per cent of the production in the twenty years from 1880 to 1899 and 23 per cent from 1900 to 1919.

VIII.

	Percentage of Total Value	
	1880–1899	1900–1919
Foodstuffs imported into the United States	16.92	12.51
Foodstuffs exported from the United States	21.80	14.09

IX. Percentage of increase in areas irrigated by government projects.

1915 to 1916	13 per cent	1917 to 1918	9 per cent
1916 to 1917	11 per cent	1918 to 1919	6 per cent

X. The imports of edible vegetable oils into the United States were $2\frac{1}{2}$ times as great in 1920 as in 1912.

XI. Approximate estimate of land available for crops or pasture.

Kind of Land	Tropical and Sub-tropical Zones. Square Miles.	Temperate and Arctic Zones. Square Miles.
Total land area	23,000,000	29,000,000
Land too dry for crops	8,000,000	7,600,000
Land too cold for crops	.....	6,400,000
Land with adequate rainfall and heat	15,000,000	15,000,000
Probable part of this ultimately arable	5,000,000	5,000,000
Cultivated at present	1,200,000	2,500,000
Arable land in pasture	600,000	1,500,000
Unused arable land available for crops or pasture	3,200,000	1,000,000

XI. Two or more crops can be raised per year in tropical countries, but tropical labor is inefficient.

7. Study the reasons for the geographical distribution of tenancy. From Table 10, Col. I, draw an isopleth map of tenancy. Apply different colors to (I) the nine states where the percentage of tenancy among the farmers is greatest, (II) the nine standing next in this respect. Study your map in the light of the accompanying table which shows the average conditions in these two groups of states and in three others (10 states each) arranged according to the percentage of tenancy.

Groups of States	A Per Cent of Farms Run by Tenants	B Per Cent Engaged in Agriculture	C Value per Farm	D Per Cent of White Farmers	E	F	G	H	I	J	K	L	M
					Per Capita Production of Crops								
					Wheat, Bushels	Barley, Bushels	Oats, Bushels	Corn, Bushels	4 Main Cereals, Combined	Potatoes, Bushels	Tobacco, Pounds	Cotton, Bales	Hay, Tons
I....	56.8	55	5,263	62.0	4.5	0.1	7.6	28.1	40.3	1.3	19.6	0.48	0.4
II....	38.4	36	21,434	86.5	24.6	5.3	30.4	74.0	134.3	2.9	25.8	0.01	1.0
III....	25.6	29	12,882	78.5	16.0	3.6	13.4	21.2	54.2	5.2	1.0	0.00	0.9
IV....	17.6	26	14,877	78.8	11.2	3.1	8.1	10.3	32.4	5.4	3.1	0.05	1.4
V....	9.4	28	13,136	79.6	7.5	1.4	7.0	4.2	20.1	8.5	3.2	0.00	2.5

What relation, if any, can you detect between the percentage of people engaged in agriculture and the *percentage* of those same people who are tenants? Does the presence of manufacturing with the corresponding reduction in the percentage of farmers help the farmers to own their farms? How can you be sure of your answer?

What indications can you see that both poverty and prosperity among the farmers tend to promote tenancy? How is this possible? Keep your explanation in mind, and see if it agrees with the one given later in this book.

What significance has the fact that in the preceding table, Col. D is low in Group I and high in Group II? In what crops do Groups I and II in the table excel? What relation have the cash value, salability, and durability of a crop to the spread of tenancy? Arrange the following products in the order in which you would rather have them as security for a loan: tomatoes, wheat, potatoes, cotton, corn, tobacco, oats. What relation has this to tenancy?

Why does Col. J of the table in this exercise (and to a less extent Col. M) show a regular increase as the amount of tenancy diminishes? In answering this consider climate, type of agriculture, number of farm animals, and the amounts of other crops as shown in the other columns.

Sum up your conclusions as to the conditions which accompany tenancy in different parts of the United States. Which are causes and which results?

CHAPTER XXV

MANUFACTURING AS A SPECIALTY OF THE UNITED STATES

The Rank of the United States in Manufacturing.—In 1923 the total value of the manufactured products of the United States reached the enormous total of over 60 billion dollars. When we deduct the value of the raw materials, 35 billion dollars, there remain 25 billion as the value added by manufacturing. This is about twice as much as the net value of all farm products, yet the number of persons engaged in manufacturing and in agriculture in 1923 was almost identical, being about 11,000,000. How the value of the manufactured goods in the United States compares with that in other countries cannot be determined, for the standards of value and the methods of keeping statistics vary greatly. Moreover, the Great War prevented accurate census returns in Europe, and still causes production there to be abnormal. This much, however, is clear: the activity of the United States, combined with its huge population, makes it to-day by far the greatest manufacturing country. Its chief manufacturing districts probably produce more per capita than any other parts of the World. Nevertheless, the United States stands second to western Europe, not only in the total amount of manufacturing, because of Europe's large population, but also in the percentage of the population engaged in manufacturing (Figs. 116 and 141).

The Permanence of Manufacturing in the United States.—It is sometimes supposed that manufacturing is a relatively new development in the United States, and that it has grown amazingly in recent decades. This is partly true, but ever since the manufacturing era was ushered in by the steam engine, cotton gin, and other mechanical inventions, manufacturing has been an important industry in this country. For example, according to the census of 1810 the total annual value of manufactures amounted to $198,000,000, or $27.40 per capita in 1809. A century later the value was $20,672,000,000, or $224.50 per capita. These figures at first suggest that manufacturing in 1909 was about eight times as important as in 1809, but that is not correct, for the purchasing power of money decreased greatly during the nineteenth century. For example, in 1849, the earliest year for which data

are available, the average wage earner in factories received $246 per year, while in 1909 he received $518. Most of this difference was due to a general increase in the cost of living. In 1809 a dollar was worth fully three times as much as a century later. Thus the $27.40 of manufactures per capita in 1809 would have been worth over $80.00 if the prices of 1909 had then prevailed. If we reckon in another way, the result is similar. In 1849 the wage earners in manufacturing industries numbered 4.1 per cent of the total population, and in 1909, 7.2 per cent.* In 1809, the figure was probably not far from $2\frac{1}{2}$ or 3 per cent

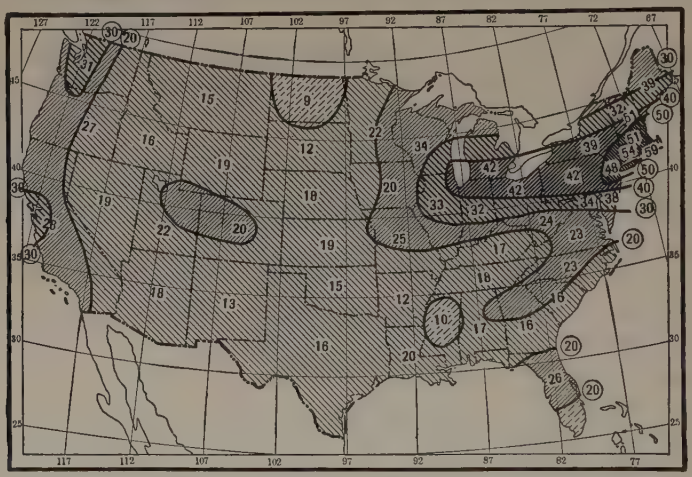


FIG. 141.—Percentage of Gainfully Employed Persons in the United States Engaged in Manufacturing, 1919.

while in 1919, when the factories employed more than the normal number of people, it had risen to 8.6 per cent. The general conclusion to be drawn from all these figures is that as long ago as 1810 the manufacturing industries of the country were perhaps a third as important as to-day in proportion to the population. But even in England, where manufacturing first became important, the percentage of the total population engaged in manufacturing industries was apparently not much more than a third as great in 1809 as now. Hence it appears that in proportion to the population and to the degree of development of machinery, the United States has ranked high in manufacturing for at least a century.

The Places where Manufacturing Increases.—Manufacturing tends to remain in the same places generation after generation. It expands

* Proprietors, firm members, and salaried employees are omitted because no record of their number is available before 1904.

rapidly in new regions only under certain clearly defined conditions. For example, from 1899 to 1919 the percentage of the population engaged as wage earners in the factories of the United States increased from 6.2 to 8.6 per cent for the country as a whole. But this increase of 2.4 per cent was by no means distributed equally as appears in Fig. 143.

A comparison of this with Fig. 141 shows that on the whole the greatest additions to the manufacturing population were in regions where manufacturing was already fairly well developed. The most rapid increase was in Michigan and Ohio where the lake transportation, nearness to coal and iron, nearness to the great market of the level farming

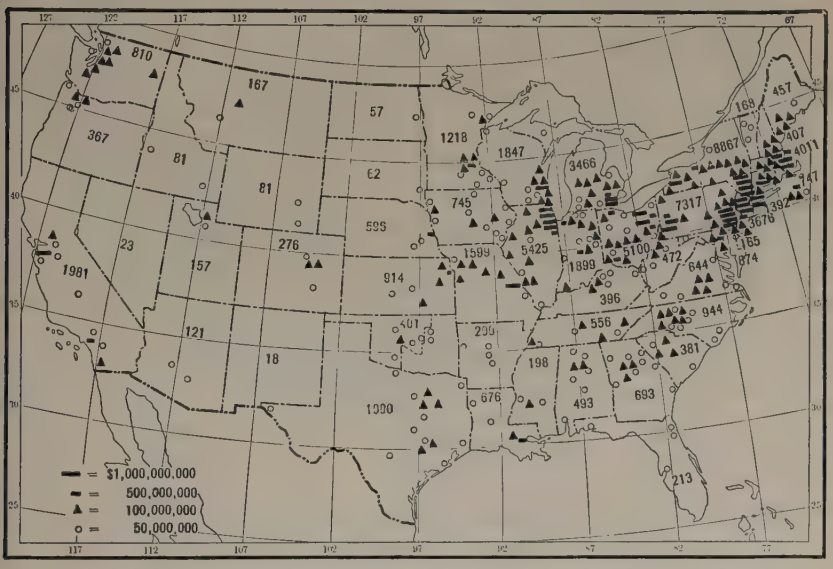


FIG. 142.—Total Value of Manufactures in the United States, 1919.

states, and a location in the best climatic zone of the country helped to cause the automobile industry to become firmly established between 1900 and 1920. Other regions that showed a relatively large growth in manufacturing were New Jersey, West Virginia, Indiana, Illinois, and Wisconsin, all within or on the border of the area of most intensive manufacturing as shown in Fig. 141. The only other states that rivaled these were Oregon, Washington, and Idaho where another manufacturing center begins to show many resemblances to that of the North Atlantic and lake states, North Carolina with its cotton factories, and Louisiana with its sugar industry. The area where manufacturing is carried on with great activity is apparently expanding, but there is a

strong tendency for the greatest expansion to take place where industry is already well established. Such regions seem to be especially adapted to manufacturing.

The Distribution of Manufacturing in the United States.—A comparison of Figs. 51, 141, and 142 shows that the following eight areas can be differentiated according to the amount and nature of their manufacturing and the degree to which they seem fitted for industrial development: (1) a great manufacturing area along the North Atlantic Coast from Maine to Maryland, or more specifically from Portland to

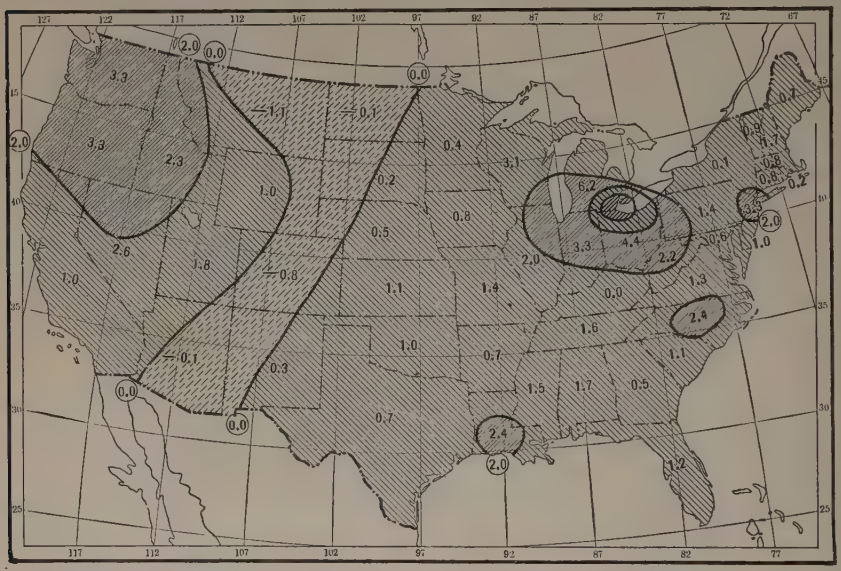


FIG. 143.—Growth in Manufacturing in the United States, 1899 to 1919.

Amounts by which the percentage of the total population engaged in manufacturing in 1919 exceeded the similar percentage in 1899.

Baltimore; (2) an almost equally important westward expansion of industrial activity from the North Atlantic Coast approximately to the Mississippi River, chiefly in the Lake States, but extending to St. Louis, St. Paul, and Minneapolis; (3) a minor southward expansion evident in the cotton manufacturing of the Carolinas and Georgia, the iron industry of Alabama, the sugar refining of Louisiana, and the tobacco factories of Florida; (4) a tendency toward westward expansion in Iowa, Kansas, Colorado, and Utah; (5) an important new area of industrial development along the Pacific coast; (6) a region of slight industrial development in the northern Great Plains and Rockies; (7) a similar region in the southern Great Plains and Rockies; and (8) a region of

slight development in the lower Mississippi Valley and southern portion of the Appalachian Plateau.

The Types of Industry in Different Parts of the Country.—Another evidence that the various parts of the country vary greatly in their adaptation to manufacturing is found in the kinds of industries in different regions. In Chapter XXI all industries were divided into three groups: (1) primitive, (2) simple, and (3) complex. The primitive, or home and hand industries may here be omitted. The simple industries, it will be remembered, are primarily those which prepare local raw materials for market, and in which the raw materials pass through only a few simple processes. For example, cotton ginning is the main simple industry connected with cotton, although the pressing of the seeds for oil falls in the same class. Cotton spinning is somewhat complex because it begins with a product that is already partially manufactured. The making of cotton dress goods with highly varied colors and patterns and perhaps with an intermixture of wool or silk is a higher and far more complex stage of the cotton industry. Part of the products of simple industries are finally consumed in the form given them by the first simple process of manufacturing. This is usually true of artificial stone, butter, canned goods, cement, and charcoal. But the pig iron made in blast furnaces is almost wholly used as material for more complex manufacturing, such as the making of steel rails, bridge girders, engines, watches, and hundreds of other products. Butter, flour, and shelled peanuts may be used in the complex manufacturing of bakery and confectionery products; grindstones may be used in the complex work of tool making; lime in the highly complex chemical industries; and lumber in complex furniture making. Thus the simple industry is the first step in preparing a product for market. It may also be the last step, as in the case of many food products and building materials.

Some simple products, like flour- and grist-mill products, are made in every state; others, like ice, in every state except a few where some natural condition makes them unnecessary; and still others, like canned fish, fertilizer, and shelled peanuts, in a relatively few states where the raw materials are readily available. The simple industries are most numerous in the states where manufacturing in general is most active, provided those states are large enough to have abundant natural resources. Ohio, Illinois, and Pennsylvania stand high in this respect. A little state like Massachusetts where the census gives details as to 24 simple industries exceeds a great state like Mississippi with only 17 simple industries, for the spirit of manufacturing prevails in the one case and not in the other. In the same way tiny Rhode Island (14)

far exceeds great North Dakota (7), while little Connecticut (19) ranks almost with Texas (23).

Contrasted with the simple industries are the complex industries which produce such goods as electric fixtures, steam engines, cotton cloth, rubber tires, newspapers, bread, dyes, optical instruments, clothing, and hundreds of other articles. A few of these, such as bread and the simpler kinds of cloth, might almost be considered the products of simple industries, for the dividing line is not sharp, but the rest are clearly complex. Fig. 144 shows the number of complex industries for each simple industry in each state as listed in the census reports: Notice

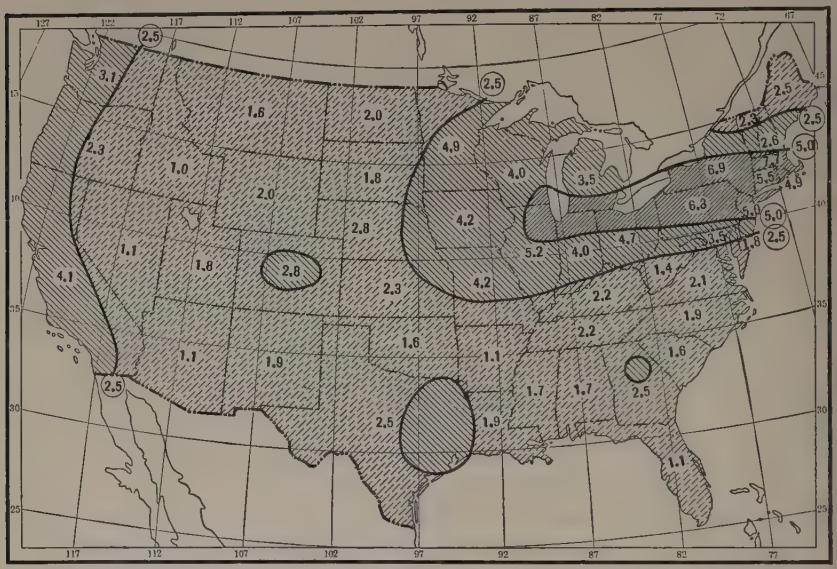


Fig. 144.—Number of Complex Industries for Each Simple Industry, 1914.

that this map is almost like Fig. 141 showing the percentage of the population engaged in manufacturing. In other words where a small proportion of the population is engaged in manufacturing, the simple industries that depend on local raw materials are relatively important. On the other hand where a large proportion of the population is engaged in manufacturing there is not only a great development of local simple industries, but still more of complex industries which depend upon raw materials from a distance, and in which the value added by manufacture is relatively great compared with the small value added by such simple operations as grinding flour or converting cream into butter. This contrast between the types of manufacturing in the strongly industrial districts would be still greater if we omitted such almost universal

occupations as ice-making, printing, railroad shops, bakeries, and tailoring establishments. If that were done we should find that the complex industries are even more localized than is shown in Fig. 144.

The Iron Industry as an Example of Simple versus Complex Manufacturing.—The iron industry affords an excellent example of the way in which a simple industry is located where the raw material or fuel is found, while the corresponding complex industry follows other rules. Fig. 145 shows the value added by manufacture in the blast furnaces in 1919. In a blast furnace, it will be remembered, iron ore is mixed

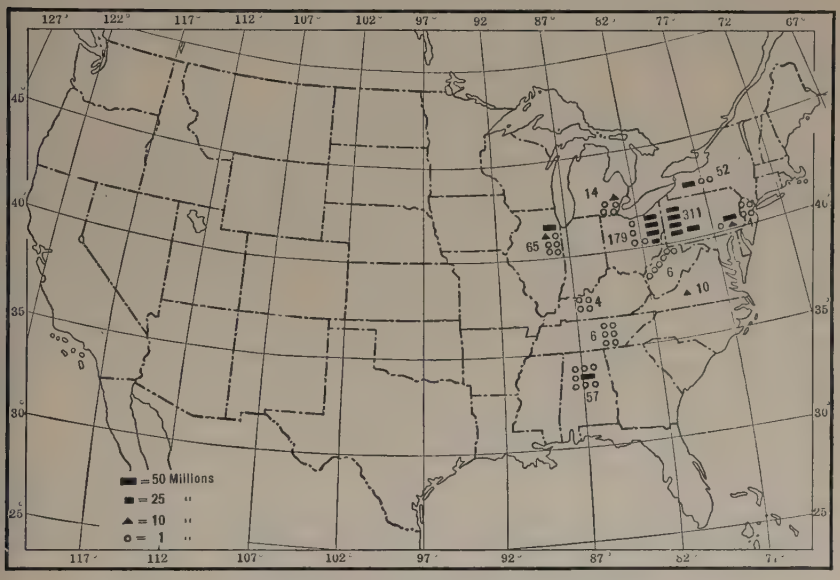


Fig. 145.—Distribution of Blast Furnace Production, 1919.

Figures represent millions of dollars. Indiana has extensive blast furnaces, but the Census does not give the figures because all belong to the United States Steel Corporation, and the law does not permit the data for a single company to be disclosed.

with coke and limestone, and air heated to about 1500° F. is introduced. The heat allows the non-metallic parts of the ore and other impurities to combine with the lime, while the molten iron drains into pits from which it can be run off to make pig iron. Each ton of ore demands more than two tons of coal and lime together. Therefore the regular method is to carry the ore to places where both coal and lime are locally available. Hence, Lake Superior ore is shipped in large quantities to western Pennsylvania and eastern Ohio; some goes to other lake cities, and some is smelted at Duluth with coal brought in the returning ore ships. The Birmingham region has the advantage of having coal, iron

ore, and lime all together. Thus in Fig. 145, the distribution of the simple blast furnace industry can be largely explained by the location of the raw materials and fuel and by the facilities for transportation by water.

Turn now to Fig. 146, showing the value added by manufacture in steel and rolling mills where steel is prepared in large masses like rails, plates, and girders, but is not put into final form as part of machinery. In proportion to the value of the raw materials the value added by manufacture is much greater than in the blast furnaces. This is because

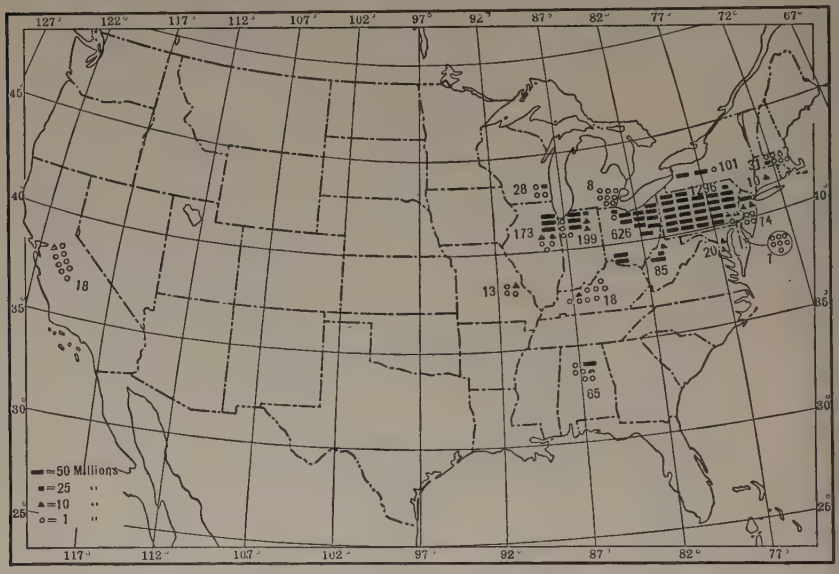


Fig. 146.—Distribution of Production in Steel Mills and Rolling Works, 1919.

Figures represent millions of dollars.

we are now dealing with a complex industry in which expensive machinery and large amounts of labor are required. This industry centers chiefly in the northern pig-iron area, but spreads out to the Atlantic coast and the Mississippi River. Alabama does not have enough steel and rolling mills to rank high in Fig. 146 although it stands fourth in Fig. 145. On the other hand, Massachusetts, New Jersey, New York, and Indiana all join with Pennsylvania, Ohio, and Illinois in surpassing Alabama in Fig. 146. This illustrates the way in which the more complex industries tend to be concentrated in the northeastern quarter of the country.

In Fig. 147, showing foundries and machine shops, the process of carrying the iron and steel away from where they were produced to the

areas of active manufacturing, especially in New England but also in the Middle West and on the Pacific slope, has gone still farther. The early settlement of New England gave it a start in preparing machinery for its own cotton and woolen mills, and thus in supplying the whole country with machinery. On the other hand, Alabama practically disappears when it comes to making highly complex articles like machinery and implements. If a map of agricultural implements were added to the present series we should see that the center of production shifts to

Fig. 147.—Distribution of Foundry and Machine-shop Production, 1919.

Figures represent millions of dollars.

Illinois to be near the great farming districts, but it still remains in the same general latitude as in Figs. 145 to 147.

How Complex Industries Differ from Simple Industries in Location.—A study of other industries shows a similar variety of circumstances which combine to determine the distribution of production. For example, although the number of cattle per capita (Table 19) varies from 0.05 in Rhode Island to 4.61 in Nevada, there is no state which has not a considerable number. Yet the slaughtering and meat-packing industry is largely concentrated in Chicago, Kansas City, and the surrounding regions, with minor centers on the North Atlantic coast and at San Francisco. In other words the raw material, in the shape of live cattle, sheep, and swine, moves toward the manufacturing centers where the

demand is greatest. In order to be made into boots and shoes the leather derived from the cattle is still further concentrated. Far and away the greatest production of shoes in proportion to the population is in Massachusetts and New Hampshire. A large proportion of the men who raise cattle in New Mexico, for example, or slaughter them in Kansas City or Chicago wear boots made in Brockton or other Massachusetts cities. Other regions, especially St. Louis, make many shoes, but only a negligible number are made south of Virginia and Kentucky and west of Missouri and Minnesota. The only important exception is California, which is beginning to make a good many. In fact, San Francisco and the cities of the Willamette Valley and Puget Sound region show many indications that in time they will develop manufacturing industries much like those of the eastern seaboard.

In the case of industries where the raw material is of small bulk or light weight so that transportation plays only a minor part in the price, a still greater concentration is seen. For example, the silk industry of the United States is overwhelmingly concentrated in New Jersey, eastern Pennsylvania, New York, and Connecticut, and is recorded in the 1923 census in only four other states; namely, Massachusetts and Rhode Island, which employ 9 per cent of the silk workers, and Maryland and Virginia which employ only 1 per cent. In other words the industry is practically restricted to the old manufacturing region of the Atlantic seaboard. The bronze and copper industry shows a similar concentration in Connecticut and New York, but is growing in importance in the states from Maine and Maryland on the east to Missouri and Minnesota on the west, and again in the three Pacific states. Nevertheless, outside of Connecticut and New York the consumption of copper in factories, as appears in Fig. 113, is significant only in Chicago, Cincinnati, St. Louis, and Kenosha, Wisconsin, together with Great Falls, Montana. The case of Great Falls is interesting because it is like that of the southern cotton mills, where the presence of a raw material, supplemented by cheap water power, is attracting an industry away from the main manufacturing regions. Copper, unlike iron, is rarely used for massive articles. It is chiefly made into small and rather highly manufactured products like the wire coils of motors and dynamos, the parts of electric lights, and various fittings of machinery and furniture where it often is used in the form of brass. Hence the cost of transportation is a relatively small item in the ultimate cost, and copper is manufactured in the regions where manufacturing is already most active and where the brass and copper plants can be near electrical and automobile factories and other consumers on whom they depend for orders.

The Divided Cotton Industry.—The cotton spinning and weaving industry furnishes another kind of example of the same principle. When the weaving of cotton cloth first became important it developed mainly in New England for several reasons: (1) the people were of a highly energetic and progressive type; (2) the climate was favorable both for human activity and for weaving, being damp enough so that the thread did not break as is the case in drier climates; (3) the poor quality of the soil, together with the energetic character of the people and their location on the seacoast, had already led them to develop a considerable trade, so that it was relatively easy and inexpensive for them to bring cotton from the South; (4) these same conditions had caused a concentration of people in commercial towns so that a sufficient supply of labor was available. In the South a different set of conditions were unfavorable. Though the white people may have been as competent as those of New England, the climate not only made cotton manufacturing more difficult than on the northeastern coast but made the people less active. It likewise helped to make slavery profitable while in the North this did not pay. These conditions served to make the white people despise all kinds of manual work, including that of factories. They also hindered the growth of cities, spread the population out upon farms, and checked the concentration of an industrial population. Moreover, the seacoast, being a coast of emergence with few good harbors, was not so favorable as the depressed New England coast with its many good harbors.

The result of the opposed conditions in the North and the South was that the northern states had a practical monopoly of cotton manufacturing until the Civil War and for about two decades thereafter. Then a change came about, partly through the abolition of slavery and the growth of southern cities, and partly through the fact that improvements in manufacturing reduced the cost of labor in the making of cotton cloth. Such a reduction meant that the cost of transportation, which was not reduced to so great an extent, became a more important factor. These conditions and others, including the availability of water power, led to a great development of cotton manufacturing in the Cotton States, especially in the Piedmont region of the Carolinas and Georgia. The southern industry has increased so rapidly that it now consumes much more cotton than the northern industry. Moreover, the consumption of cotton in the North remains almost stationary, whereas in the South it is still increasing rapidly, as appears from the following figures showing the cotton consumption in millions of pounds during various years:

	1909	1914	1919	1923
New England	866	860	870	996
Cotton states	1031	1180	1351	2140

In 1923 North Carolina, with 351 cotton mills, had one-fourth of the 1375 establishments in the United States, and nearly twice as many as Massachusetts (191).

But the cotton industry of the North is not of the same type as that of the South, as appears from the following figures showing what percentage of the yarn is coarse (20 counts or under):

	1900	1909	1914	1919
New England	40.9	33.5	31.7	28.9
Cotton states	76.0	61.4	53.2	58.8

The percentage of coarse yarn is nearly twice as great in the South as in New England. Moreover, while there has been a steady decrease in the percentage of coarse yarns in New England from 40.9 per cent in 1900 to 28.9 in 1919, the similar decrease in the cotton states came to an end in 1914, and was replaced by an increase from 53.2 to 58.8 per cent in 1919. The same fact is illustrated by the following figures showing the percentage of doubling and twisting spindles, which make fancy kinds of thread, in comparison with all the active spindles:

	1909	1914	1919
New England	6.4	7.2	8.5
Cotton states	8.0	7.3	7.8

In other words, in 1909 the southern states were making a larger proportion of high-priced specialized types of thread than were the northern states, but in the succeeding years their percentage of these types has diminished while that of New England has increased.

The weaving section of the cotton industry shows the same conditions as the spinning section. This appears in the following figures, which show the average value of the woven cotton goods per square yard when all kinds of goods are averaged together:

	1900	1909	1914	1919	1923
New England	5.1	7.8	7.9	24.9	17.9
Cotton states	4.6	6.3	6.3	20.3	14.8
Excess value of northern yard in per cent of southern	11	24	25	23	21

The most obvious fact here is that, taking all kinds of goods together, a square yard has had a greater average value when made in the northern mills than when made in the southern mills, ever since 1900. Still more significant, however, is the fact that the percentage by which the value of a northern yard exceeds that of a southern yard has increased. In 1900 the northern yard of cotton averaged only 11 per cent more valuable than the southern yard. In 1921, in a period of high prices the difference rose to 35 per cent, and even during the depression of 1923 it amounted to 21 per cent. Individual southern mills make cloth of high quality, and many northern mills make inexpensive types of cloth. Nevertheless, the general tendency has been for the northern and southern sections of the cotton industry to pull apart in the quality of their woven goods just as in that of their yarns. In other words, in this industry as in practically all others, the simpler goods tend to be produced near the raw material. The complex goods tend to be produced where other conditions, such as labor and climate, tend to generate great manufacturing centers.

The Factors that Determine where Manufacturing shall be Active.—In considering the factors that determine where manufacturing is located, it must be remembered that sometimes one factor is most important and sometimes another. One factor may determine the general location of an industry, while still another may determine its exact position. (1) Climate, through its relation to health and energy, is as important in the United States as in the rest of the world. Its part in determining the degree of activity of manufacturing may be judged somewhat from the strong resemblance, between Figs. 43, 45, 141, and 144. It is also evident from Fig. 38 which shows how the health and energy of factory operatives vary from season to season in close harmony with the weather. It cannot be made too clear, however, that climate and health are chiefly important in determining the degree of activity and not its kind. Moreover, they do not prevent other conditions, such as transportation, the age of a community, or the selected quality of its people, from having an equally marked effect.

(2) The importance of transportation in determining the location of

American industries is evident in the fact that among the manufacturing cities of the United States with a population of over 500,000 in 1920 every one is provided with water communication. Except for St. Louis and Pittsburgh these cities are all on the ocean or Great Lakes. Another evidence of the importance of transportation is the concentration of American manufacturing in strips: (*a*) the North Atlantic Coast (*b*) the shores of the Great Lakes, (*c*) the Pacific Coast and the Willamette Valley, (*d*) the Ohio and Mississippi rivers, and (*e*) certain railway lines such as the New York Central.

(3) A vast number of American industries owe their location to the presence of raw materials. The making of brick, the ginning of cotton, the canning of fish or fruit, the sawing of lumber, and the dressing of rock are almost invariably carried on where the raw material is produced or else where transportation by water enables the bulky raw material to be carried easily and cheaply to some more convenient place.

(4) The presence of fuel or water power has a similar effect in determining the location of industries, especially those of a simple type. We have already seen how this works in the case of blast furnaces. In some cases such as ore smelting, the location of the industry depends upon the complex balance between the cost of transporting the raw ore, the cost of transporting the coal or of obtaining hydroelectric power, the cost of carrying the finished product to market, and the presence of skilled labor, as well as several other factors. Thus some South American ore comes to northeastern New Jersey to be smelted, because that is the cheapest method, when all things are considered.

(5) A supply of labor is quite as important as any of the other factors. That is one reason why the Atlantic Coast maintains the lead in manufacturing. When European immigrants reach the United States they naturally go to work in the factories of the coast rather than in those that are farther away. The skill of the labor supply is as important as its volume. Some of the cotton towns of Massachusetts, such as Fall River, or the brass towns of Connecticut, such as Waterbury, contain a large body of workmen skilled in certain industries. New industries of the same sort can be established elsewhere only by bringing workers from a distance, or by a slow and costly process of training new ones.

(6) An industry needs capital as well as raw materials, fuel and labor. Hence the presence of capital influences the location of many industries in the United States. Fig. 148 indicates the relative abundance of capital in various parts of the country, for where many people have incomes above the average there is surplus capital for investment. Obviously the places where capital is available are the great cities of the

North Atlantic Coast from Boston to Washington, the great cities of the Pacific Coast and such intermediate cities as Chicago and Detroit, together with the smaller cities all the way from the North Atlantic Coast westward along the general line of the southern Great Lakes to Colorado and Wyoming. This region corresponds quite closely with the main manufacturing section but is prolonged westward by favorable conditions of agriculture and by mining in Colorado and Wyoming. How far it is due to manufacturing and how far to other causes it is impossible to say, but undoubtedly manufacturing tends to produce

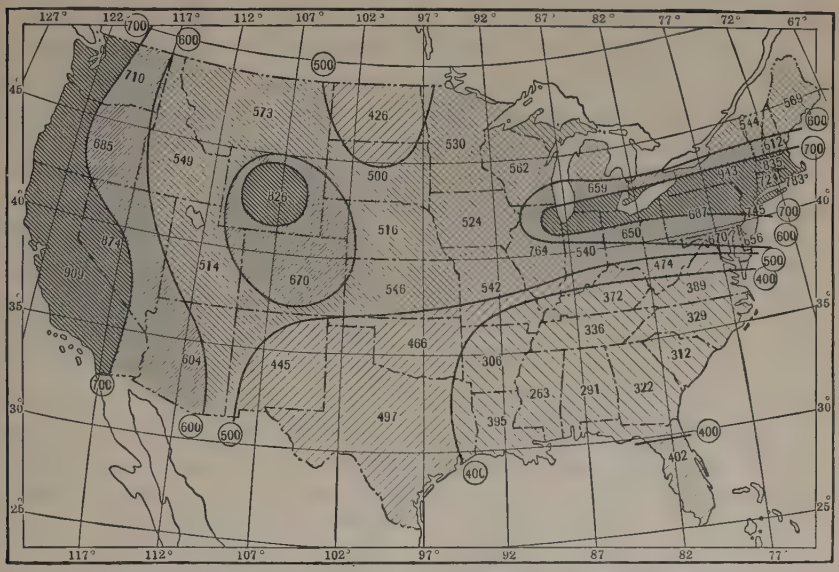


FIG. 148.—Average Annual Income per Capita, 1919, 1920, 1921.

surplus capital for investment and such capital in turn leads to further manufacturing. Although many investments are made in distant regions, it is almost always easier to get capital for a local industry than for one far away.

(7) The sale of goods is as important as the making of them. Hence the presence of a market is one reason for the location of many industries. For example, the Pacific Coast might buy its manufactured goods from the East, or the East might buy from Europe. But in both cases there is a growing local market, and the tendency is to supply that market with goods made locally, and thus reduce transportation charges. Of course many other factors enter into the matter, so that one cannot say that any one is the sole cause of the location of an industry. San

Francisco and Seattle would probably not be such flourishing industrial centers if they were located in a hot climate, if they were not on the seacoast, if they did not have some raw materials such as lumber, if they were not able to bring coal by sea, if they were not large enough to have an appreciable surplus population to draw on for new industries, and if they did not have a good supply of capital. But all these conditions would not cause manufacturing unless they were accompanied by a market in which the manufactures can compete with those of other regions on fairly equal terms. As a matter of fact, the Pacific Coast is less favored than the Atlantic in most of the conditions that lead to manufacturing, and hence cannot manufacture as cheaply as can the eastern states. But the fact that the Pacific Coast has its own market west of the Rockies and that it there has a decided advantage over the East in transportation charges joins with energetic people, cheap water power and petroleum in making it easy for industries to expand.

(8) Certain accidental causes also may determine where manufacturing is located. The original choice of Troy for a collar factory, Gloversville for gloves, Bridgeport for brass, Lynn for shoes, and Detroit for automobiles was more or less accidental. That is, the general region in each case was favorable, but if the first factories had been located 50 or 100 miles away in some similar location they might have been equally successful. When once an industry is established, it is easy for other factories of the same kind to come in. They can draw a few skilled workers from the old plants, and thus get under way. The routes along which raw materials and fuel are brought are already established, the selling avenues are open, and people who have money to invest know that the business has already succeeded. Such considerations have much to do with the fact that particular kinds of business tend to cluster in limited areas.

(9) Another accidental cause is the mere question of age. Since New England was already fairly well settled when machinery was first applied to manufacturing on a large scale, while western New York was the frontier, and Ohio and the states farther west were a wilderness, many New England industries obtained a start which has given them an almost unshakeable lead. But when a country begins to manufacture a new product like automobiles, maps, cameras, or moving-picture films, a new industry has a chance to develop in places like Detroit, Chicago, Rochester, and Los Angeles.

From all this it appears that while the general activity of a region in manufacturing depends largely on the character and energy of the people, the exact location of any special industry depends upon a great variety of interacting causes.

EXERCISES AND PROBLEMS

1. From Col. B, Table 31, prepare an isopleth map using such intervals and such types of shading that you bring out the eight areas named on page 370 and show the relative intensity of their manufacturing interests. In making this map let the isopleths be at irregular intervals if necessary. The presence of large cities with their high percentage of factory people makes it right to draw the isopleths in such a way that cities like Baltimore, St. Louis, St. Paul, and Minneapolis, are included within areas where the manufacturing activity is greater than in their states as a whole.

In which of the eight areas does your home fall? In the State supplement of the Abstract of the last census look up the number of persons engaged in manufacturing in your own city or the nearest city with over 50,000 inhabitants, and calculate what percentage they form of all the persons engaged in gainful occupations. How does your city compare with your state in this respect? How and why does it differ? What part of the United States does it most resemble in its proportion of factory workers? (See Table 47.)

2. In the supplement to the Abstract of the Census or in a special Census bulletin find the table of the individual industries of your own city or of the nearest city of over 50,000 inhabitants. Divide the industries into two lists (*A*) simple industries, and (*B*) complex industries. In each list arrange the industries according to the total number of persons engaged in them. Insert (*a*) total number of persons engaged in industry, (*b*) number of establishments, (*c*) capital, (*d*) wages of wage earners, (*e*) taxes, (*f*) expenses for principal materials, (*g*) value of products, and (*h*) value added by manufacture. Complete the table by adding the names and places of origin of the chief raw materials. Use the table as the basis of a report on the manufacturing of your city with special reference to (1) the degree of complexity of the industries, (2) the regions upon which they rely for raw materials, (3) the degree of importance of the different industries as measured by the number of workers, the *local* expenditure of money, and the payment of taxes.

3. Choose some city which you think is quite different from your own and treat it as your own was treated in Ex. 2. Write a report on the way in which geographical conditions cause the industries of that city to differ from those of your own.

4. In the accompanying table twelve groups of industries are arranged according to the number of wage earners in 1923. Compare the textile group with some other in the following respects: (*A*) Wage earners per factory. Explain why the factories are large or small. (*B*) Capital per wage earner. What relation has this to amount and complexity of machinery, cost of raw materials, and degree to which they have been manufactured? (*C*) Wages per year, as influenced by (*a*) amount of skilled labor, (*b*) number of women employed, (*c*) seasonal character of industry. (*D*) Cost of materials per wage earner. Does a high cost mean that much or little value is added by manufacture as shown in Col. J? Explain. (*E*) Percentage of value added by manufacture. Consider effect of degree of skill, amount of machinery, degree to which raw materials have already been partly manufactured, etc.

5. Select an industry in your own town which falls in one of the groups in the table. Find out as much as possible about it along the lines of the table and as to where and how it gets raw materials, where and how it sells its products, how far it is seasonal and why, percentage of woman employed, etc.

SUMMARY OF TWELVE GENERAL GROUPS OF INDUSTRIES, 1923

A	B	C	D*	E	F	G	H	I	J
Group	Number of Establishments	Wage Earners' Average No.	Capital	Wages	Average Wages per Year, Dollars	Cost of Materials	Value of Products	Value Added by Manufacture	Per Cent of Value Added by Manufacture
	Thousands		Millions of Dollars			Millions of Dollars			
All industries	196	8778	22,791	11,007	1253	34,641	60,507	25,867	43
1. Textiles and their products	27	1719	2,811	1,748	1017	5,408	9,487	4,079	43
2. Lumber and allied products	22	932	1,723	963	1033	1,666	3,633	1,967	54
3. Machinery except transportation equipment	12	908	.....	1,254	1381	1,892	4,729	2,837	60
4. Iron and steel except machinery	6	893	4,282	1,325	1484	4,153	6,829	2,676	39
5. Food and kindred products	52	682	2,174	796	1167	6,995	9,530	2,535	27
6. Transportation equipment	4	606	.....	963	1589	3,395	5,333	1,939	36
7. Paper and printing	26	528	1,433	743	1407	1,545	3,770	2,225	59
8. Railroad repair shops	2	523	366	773	1478	631	1,520	889	58
9. Chemicals and allied products	9	384	3,304	501	1305	3,680	5,707	2,026	37
10. Stone, clay and glass products	8	348	1,262	449	1290	580	1,559	979	63
11. Leather and its finished products	5	345	543	389	1128	1,075	1,878	802	43
12. Metallic products (except iron and steel)	7	297	1,014	394	1327	1,683	2,557	874	34

* 1919.

6. Determine which industries are most widely spread in the United States. Let two students working together make a list showing the names of all the manufacturing industries mentioned in Table 32, and the number of states in which each is mentioned. Explain the reason why two manufacturing industries stand among the three most important in so large a proportion of the states.

7. Shade heavily the states in which railroad shops are the most important industry, less heavily those where they are second, and lightly those where they are third (Table 32). How far is their importance in the first group of states related to (*a*) the railroad mileage per square mile? (Make an isopleth map from Table 37 C) (*b*) the railroad mileage per inhabitant (Table 37 B)? (*c*) the general prevalence of manufacturing (Fig. 141)? Explain the industrial contrast between the states where railroad shops are the foremost manufacturing or mechanical industry, and those where they fail to come among the first three industries.

8. Draw for lumber mills a map like the map of railroad shops in Exercise 7. Explain the peculiar features of the distribution of such mills in relation to (*a*) relief, (*b*) sparsity of population, (*c*) the amount of manufacturing.

9. On an outline map insert the name of the most important manufacturing industries, omitting railroad shops and lumber mills, and also printing establishments

because printing is an almost universal industry. Where foundries appear on your map add the name of the next succeeding industry, for foundries likewise are almost universal in modern civilization. Shade on your map the types of areas given below, and determine for each the degree of activity of manufacturing and its character as shown in Figs. 141, 142, 143, and 144; also point out in each case the relation of the given industry to local raw materials, and its importance to the country as measured by the number of persons actually engaged in the industry in the regions where it appears on the map: (*a*) Areas where relatively simple food industries predominate. Explain the distribution of the three areas of this type. What two states need to be shaded in order to unite the three into a single area? Why are those states not shaded? How highly are the food-producing industries developed in them? (*b*) Areas where manufactures of cotton and clothing are relatively important. Explain the contrast between the two areas in this case. How does the percentage of persons engaged in manufacturing compare in these areas? (*c*) Iron work including automobiles, engines, and foundries. What relation do these industries show to raw materials and fuel? Why? (*d*) Shipbuilding states. Explain the grouping here. (*e*) States where your map is blank because no manufacturing industries other than railroad shops, lumbering, printing, or foundries fall among the first three. (*f*) States engaged in other industries. In each state of this group explain the relation of the industry to raw materials. In which cases are raw materials produced locally? In which are the raw materials limited almost to a single article? Which require that large amounts of fuel be brought from elsewhere? To what degree does each require complex machinery, large factories, and abundant capital? Which is the most complex?

10. From Table 32 or from the Census make a list showing the industries which employ at least 90 per cent of the persons engaged in manufacturing in your state. From the city tables of the census prepare a map showing the predominant manufacturing industry in various parts of your state. Explain the causes of the distribution shown on your map.

CHAPTER XXVI

TRANSPORTATION AND COMMUNICATION IN THE UNITED STATES

The Complexity of the American Transportation System.—A complete transportation system consists of (1) ways, (2) vehicles, and (3) terminals. The ways consist of (*a*) roads, which may range anywhere from mere trails up to the finest concrete or macadam avenues; (*b*) railways of every type from portable tracks a foot wide up to six-track roads like part of the New York Central; (*c*) waterways, which include both the open ocean and inland waters; and (*d*) the ways of the air, which are not yet defined but are none the less important. The vehicles range all the way from pushcarts propelled by men up to the most highly powered automobiles, trains half a mile long, steamships large enough to accommodate a small city, and airplanes that can travel 300 miles an hour. The terminals in a broad sense include anything from a place on the side of a street where an automobile can park up to a freight yard with hundreds of tracks and scores of warehouses, or an enormous dock flanked by huge wharves covered with tracks and equipped with all sorts of complicated loading machinery. The United States contains practically every type of way, vehicle, and terminal, for the complexity of the transportation system is probably greater here than in any other country.

The Development of the American Road System.—The rural roads of the United States, as distinguished from the city streets, have a total length of nearly 3 million miles. About 150,000 miles are macadamized, paved, or made of concrete, and are nominally good; another 300,000 have been treated with sand, clay, or gravel but are often inadequate for automobile traffic. The remaining $2\frac{1}{2}$ million miles are ordinary earth roads. So important are the roads that in 1925 about a billion dollars were spent upon rural roads and bridges in the United States, nearly 40 per cent being provided by local communities, as much or more by the states, and not far from 100 million dollars by the Federal Government.

In spite of these large expenditures the roads of the United States and likewise of Canada are not so well developed as those of Western Europe. This is partly because the population in America is relatively

sparse and partly because Western Europe had completed an admirable road system before railways began to be used. The United States and Canada on the contrary were just beginning to make good roads when the railways checked this improvement. People invested their money in railways and thought that that would solve their transportation problems. To-day, however, the automobile makes people realize the enormous importance of roads. Moreover, since people now travel long distances by automobile, the roads are ceasing to be a local affair and are beginning to have state-wide and even national importance. A poor township with almost no population may be traversed by a highway over which hundreds or even thousands of automobiles travel each day. The building of 6 or 8 miles of good road to stand such traffic may cost three or four hundred thousand dollars, or possibly as much as the entire value of the property in the township. Obviously the town cannot pay for such a road and should not be asked to. Hence the responsibility for the main roads is rapidly passing from the townships and counties to the states. In fact the responsibility for the most important roads is being assumed by the nation as a whole, and it is planned to make the Lincoln Highway from coast to coast a national road of the finest type.

The degree to which good roads are developed is shown fairly well in Fig. 62. This shows that the following factors all help in the development of good roads: (*a*) a dense population, as in New Jersey, (*b*) long settlement as in Massachusetts, (*c*) a high degree of prosperity, as in California, and (*d*) levelness, as in most of Indiana.

The Main Problems of American Roads.—Three of the great problems in American roadmaking to-day are: (1) How a single road can accommodate horse-drawn traffic, heavy and relatively slow truck traffic, and rapid traffic in passenger cars. On the main highways it is almost impossible to accommodate all three. In a few places near the big cities, separate roadways for trucks and for passenger traffic have been constructed, but this is very expensive. (2) Who is to pay for the roads? This means not only how much shall be paid by township, county, state, and nation, but how much of the expense shall be borne by the users of the roads. A heavy auto truck wears out the roads far faster than a light touring car. Already the license rates for the different types of cars vary, but the rates by no means represent the relative wear and tear on the roads. (3) How can durable roads be built without undue expense? This has been discussed in Chapter XI. It is particularly important for the United States and Canada, for nowhere else is there so much automobile traffic. The fact that in North America the automobile now creates the greatest need of good

roads is beginning to lead to a development like that of Europe, but the problem is now far more difficult than formerly because of the increased wear and tear due to motor vehicles.

The Railway Conditions of America.—What the United States and Canada lack in roads they partly make up in railways. Including the whole United States and the well-inhabited southern quarter of Canada, the two countries together have an area of approximately 4 million square miles, or roughly that of Europe. In that area the American countries have about 300,000 miles of railways while the European countries have 200,000. More trains per mile of track, however, are run on the European railways than on those of America. Nevertheless, the general facilities for railway transportation in proportion to both the area and the number of people are much better in North America than in Europe.

The enormous part played by railroads in the United States may be judged by the fact that under the rates effective in 1920–1921 the country's total annual bill for railroad service was nearly 7 billion dollars, about a quarter for passenger service and the rest for freight. The percentage of profit on the passenger service is now greater than on the freight service although formerly it was less.

One of the most striking features of the American railways is the great trunk lines. In the United States many of the main systems are operated under one management from the Atlantic Coast to Chicago, St. Louis, or New Orleans, and under another from these places to the Pacific Coast. In Canada much longer stretches, such as the Canadian Pacific and the Grand Trunk and Grand Trunk Pacific, are operated under a single management. There a single train, or at least individual cars, run from tide water on the east to tide water on the west. Nowhere except on the Siberian railway is so long a stretch of line run as a single unit. Curiously enough, in the United States no trains and not even individual sleeping cars run regularly all the way from the Atlantic Coast to the Pacific. Nevertheless, even in the United States, the length of line operated as a single unit far exceeds that in any part of Europe except Russia.

The long distances covered by American railways have been one of the factors in causing American cars to be very large and easy-riding compared with those of Europe. Sleeping and dining cars are largely an American invention and nowhere else are they nearly so common as here. Freight cars in the United States and Canada are also much larger than in other parts of the world. They are also of highly specialized types such as those for fruit, stock, coal, oil, lumber, and general merchandise.

In the matter of equipment American railroads are still far from ideal. Only 36,000 miles of the 236,000 in the United States are double-tracked; only 38,000 are under the automatic block system, and only 102,000 under any block system. Another great deficiency is the extent to which the ordinary freight car remains idle. The following table illustrates the findings of an investigation as to what happens to a typical freight car during the fifty-two weeks of a normal year:

On loading and unloading tracks	14	weeks
Being switched to and from loading and unloading tracks	6	"
Awaiting shippers' orders	2	"
Idle, because of arrival on Sundays and holidays	3	"
Repairs	5	"
Stored for lack of tonnage in slack seasons	2	"
Waiting in yards en route for trains to be made up, etc.	5	"
On interchange tracks where freight is transferred from one railroad to another	9	"
Actual movement along the main line	6	"

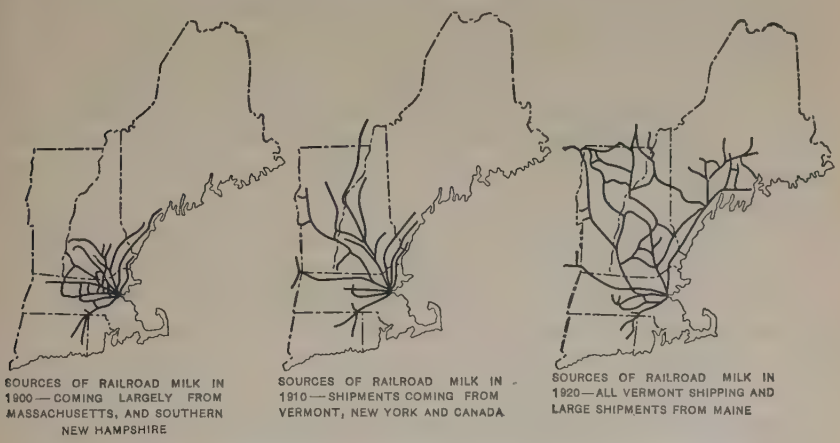

SOURCES OF RAILROAD MILK IN 1900—COMING LARGELY FROM MASSACHUSETTS, AND SOUTHERN NEW HAMPSHIRE
SOURCES OF RAILROAD MILK IN 1910—SHIPMENTS COMING FROM VERMONT, NEW YORK AND CANADA
SOURCES OF RAILROAD MILK IN 1920—ALL VERMONT SHIPPING AND LARGE SHIPMENTS FROM MAINE

FIG. 149.—Milk Routes Leading to Boston, 1900 1910, and 1920.

The average car spends half its time being loaded and unloaded, and another quarter in waiting after it has started on its journey. If deductions are made for wrecks, washouts, breakdowns, congestion, etc., the normal time that a car actually moves on the main line is reduced to thirty-seven days or one-tenth of the year. These figures help to explain why freight rates are so high. Of course a large part of the delay is inevitable, but there is clearly room for much improvement.

The Problem of Long Hauls versus Short.—It is easily seen that the railway system in America is built to facilitate long rides, long hauls,

and large loads, as contrasted with the European system built for short rides, short hauls, and small loads. This condition gives rise to one of the most difficult railroad problems. As a region becomes more thickly populated there is a growing need of short hauls and frequent service. That is what is needed in New England and the densely populated Atlantic seaboard. There a large amount of traffic takes the form of small irregular packages, manufactured goods in boxes, and miscellaneous raw materials which often come in small lots. The West, on the other hand, ships much of its freight in carload lots or train loads of wheat, stock, or other commodities. The same is true of Pennsylvania with its coal, and the South with its cotton. A similar contrast is seen in the need for terminal facilities. The West and the ports where raw materials are shipped want terminal facilities where a train load of homogeneous quality can be quickly handled. They want to be able to load or unload cars of grain or ore by merely opening a chute and letting the material pour out. Many of the efforts of American inventors have been directed along this line, so that an entire train load of coal cars or oil cars can be emptied in a few hours by running onto a high track and opening the bottom of the cars. On the other hand the intensive manufacturing industries are calling for an equally fine development of methods of loading irregular boxes and bales. That is why the problem of movable trucks and of overhead cranes as discussed in Chapter XI is primarily a problem of the eastern United States.

The Railway Problems of Power and Ownership.—Another business problem which confronts the railways is the type of fuel and the method of the application of power. To-day railroads in the United States are run chiefly with soft coal, but some burn hard coal, some oil, and some are run by electricity. Everyone agrees that the present methods waste power and that it is a pity to use fuels like anthracite, and especially oil, which are limited in quantity and are likely to be exhausted. Nevertheless, the low cost of these commodities at the places where they are produced and their great convenience and cleanliness compared with soft coal cause their use to continue. The use of electric power would be cheaper than that of any other kind, provided it did not cost so much to change the equipment and adapt it to the new source of power. Electric power on a large scale has been tried in only a few places such as the 75 miles between New York and New Haven and 420 miles on the Chicago, Milwaukee, and Puget Sound R. R. through the Rocky and Cascade Mountains. In California the Southern Pacific went extensively into the problem of using hydroelectric power. It believed that this would be the cheapest method in the long run, but

gave up the attempt because of governmental regulations hedging in the use of water power. It seems probable, however, that in course of time one of the important railway developments will be the use of hydroelectric power, at least in the mountains and the Pacific States, and of electricity derived from coal burned at large central power plants on the eastern seacoast, or at strategic interior positions to which coal can be brought cheaply.

Another railway problem of the United States is created by the demands for nationalization. With the expansion of commerce and with improvements in methods of transportation, the railway system of a large country must more and more function as a single unit. Also, it is more and more apparent that the railroads are so important that it is not right that they should be in danger of being put out of commission either by strikes or by the incompetency of private owners. On the other hand, a great many people believe that the running of railroads by the general government is an extremely inefficient and unprogressive method. Thus far the line along which these two conflicting views have been harmonized has been more and more rigid government control under the Interstate Commerce Commission while the railroads still remain in private hands.

The American Trolley System.—Trolley lines are even more distinctly American than railways. They are the natural result of the growth of large cities and their distribution in the United States is almost like that of the cities. The only important exception is that in the level regions of the Middle West, especially from Ohio to Illinois, interurban trolley lines, which are practically railroads, have been developed more than in the manufacturing regions farther east.

The nature of the transportation system of an ordinary town depends largely on the number of inhabitants. In a small village practically everyone walks to work. In a small city the majority still walk, but there are a few trolley lines and a moderate number of persons use automobiles. In a large city of 100,000 or more inhabitants the trolley system is generally quite well developed, but most of the lines run fairly straight toward the center. In such cities automobiles become an important method of going to work among the people who are well-to-do, and jitney buses are rapidly coming to be an important means of carrying people on routes where the traffic is not heavy enough to warrant the building of permanent tracks. The next stage in the development of the urban railway system is the building of what are often called crosstown lines, or lines that run wholly or partly around the city at a distance from the center. As the city grows still more, the surface lines become too slow and are too much interrupted by heavy traffic to

accommodate the people who live far out. The steam railways help to meet this condition by running local passenger trains and selling commutation tickets at low rates. This, however, often fails to meet the situation, and elevated lines are added. The last stage in the evolution of city transportation is the subway. New York, Boston, and Philadelphia are the American cities where subways are important. Although London, Paris, and Berlin also have subway systems, no other can compare with that of New York. The New York system is due not merely to the city's size but to the peculiar way in which New York is hampered by its location on a long narrow island. The city requires not only subways north and south but tunnels under the rivers to the neighboring mainland and Long Island.

Among the business problems which confront the trolley lines and other urban carriers, one of the most difficult, as we saw in Chapter XI, is competition with other methods of transportation. Another is the issue of transfers. The European method is to pay a small sum for a short ride and to pay for zone after zone on a long ride. In America, although this system has been tried, it is not common. Most American cities prefer to have a single fare for the entire city and to have a free transfer system. It sometimes seems unfair to pay as much for a ride of half a mile as for one of 15 miles, but this is like the single postal rate on letters to all parts of the country and even to many foreign countries. The flat rate of fare for rides of all lengths is good for a city because it tends to prevent congestion and slums. When a city is divided into small street car zones, the poor people tend to crowd into the quarters around the factories or other places where they work.

Automobiles as the most Distinctive American Mode of Conveyance.—We have already seen that the United States and Canada have far more automobiles in proportion to the population than any other countries in the world. Of the 21,360,000 automobiles in the world in 1924 the United States and Canada had together 18,360,000, leaving only 3,000,000 for all the rest of the world. Such a condition is one of the chief reasons why the road problem is one of the most serious that confronts the United States.

It is noteworthy, however, that in proportion to the population automobiles are not most numerous in the parts where the roads are most improved, but on the rich Pacific Coast and in the central plains where the wealth of the farmers and the levelness of the land are favorable, even though the great majority of roads are not improved and are very muddy at certain seasons. (See Fig. 62, page 165.)

The reasons for the great number of automobiles in the United States and Canada may be summed up as follows: (1) Inventiveness. The

American countries lead the world in inventions and in the speed with which they adapt new ideas to their uses. (2) Standardization of products. Only in America have automobiles been built on a huge scale with standard parts so that they can be turned out cheaply in enormous quantities. One result of this is that to-day in America three-fourths of the cars cost less than one thousand dollars apiece. (3) Abundant gasoline. The fact that the United States is by far the world's greatest petroleum producer has had a great deal to do with the growth in the use of cars. So too has the huge size and complicated organization of the Standard Oil Company which makes every effort to provide gasoline wherever it is wanted. (4) Natural wealth. Although the automomobile has now been reduced to a price not much greater than that of a horse and wagon, it still is too expensive for ordinary people except in a country where there is abundant wealth. (5) The level interior plains. All forms of transportation are greatly helped by levelness. In the case of the automobile this is not only because it is cheaper to run on a level than up hill, but because good roads are far more expensive in the rugged regions.

American Harbors and Ocean Waterways.—We have already seen that great seaports rarely grow up except where the population is progressive as well as dense, where the hinterland is productive, where communication with the hinterland is easy, and where there is room enough for a city and depth and space enough for a large harbor. The concentration of the water-borne commerce of the United States on the North Atlantic Coast shows how important these conditions are. To-day some of the greatest problems connected with ocean transportation are (1) the St. Lawrence waterway, (2) the development of better channels and larger terminals, (3) the problem of American versus foreign rates of pay for sailors, and (4) the problem of an American merchant marine and national subsidies. A deep waterway navigable for ocean vessels to Chicago or Duluth is probably practicable. It requires only that the St. Lawrence, Niagara, and Sault Ste. Marie canals be enlarged. Engineers believe that the St. Lawrence canals, which would be the longest and most expensive, can be made to pay for themselves by developing water power in conjunction with the canals. They also claim that the new supply of power would stimulate manufacturing in New York, New England, and southern Canada, the uninterrupted waterway would give the farmers of the interior cheaper transportation rates, and both conditions would stimulate the interchange of goods between the farmers and the manufacturers as well as between this country and Europe. Canada would benefit more than the United States, but this does not mean that the United States would suffer.

Some business would be diverted from New York, but that might be a distinct advantage for already New York suffers from congestion far more than from lack of business. The one great disadvantage of the St. Lawrence-Great Lakes route is that parts are frozen for three months each winter, and sometimes five.

It is sometimes supposed that if a city can make its harbor deep enough and its terminal facilities sufficiently large and convenient it can assure trade for itself. This is only partly true. A city like Portland, Maine, cannot hope to compete with Boston no matter how deep its harbor or how large its terminal facilities because it lies farther from the great centers of production in manufacturing and agriculture. Nor can Boston hope to compete with New York for the same reason and because the route from Boston to the interior is rugged while that from New York is level. Nevertheless, there is no question that unless a city keeps deepening its harbor and enlarging its terminal facilities in accordance with the growth of industry its commerce will rapidly dwindle.

One of the most serious problems that confronts American transportation is how to make an American merchant marine pay and at the same time maintain American rates of wages. At present the laws of the United States oblige the owners of vessels registered under the American flag to care for their sailors in a much more expensive way than is required by most other countries. Many shipping firms have in the past found this impossible and have preferred foreign registry even though the vessels were owned in America. It is generally agreed to be highly advisable that the United States should own a large number of ships but it is also agreed that it is not profitable to own ships which cannot earn enough to make them pay. At present the laws of the United States foster American shipping and attempt to maintain the American standard among sailors by providing that only ships with American registry shall carry goods from one port of the United States to another. When it comes to transoceanic commerce the problem is more difficult. A large number of the ships which were built during the war were tied up for several years during the succeeding period. Subsidies from the National Government to ships carrying the United States mails are thought by many people to be the best means of encouraging American shipping. Others think that this method is too expensive, and that it is better to let foreign ships carry American goods. The whole question is one of the most important in connection with America's foreign commerce.

The Internal Waterways of the United States.—On the map it appears as if the Mississippi River leading from the Gulf of Mexico into the heart of the agricultural regions of the United States ought to be

a highly important waterway. On the map it likewise appears as if the New York Barge Canal, linking America's most active manufacturing region with the Great Lakes near the most productive agricultural region, ought to be equally important. In spite of a slight recent revival, neither carries commerce of great importance compared with what could be carried, or with what similar waterways carry in Europe. The reason is partly the slowness of transportation by canal or river, partly the fact that the channels in both cases are not deep enough for ocean-going boats, partly the necessity for more trans-shipment than is needed with goods carried all the way to their destination by train, and partly the competition of the railways. New methods may increase the use of the inland waterways, but the development of the automobile and of other transportation facilities has recently lessened the demand for them.

Facilities for Communication in the United States.—*The Post Office and Telegraph.*—In the United States, as in all other advanced countries, the chief facilities for communication are the post office, the ordinary telegraph, wireless, and the telephone. While the postal service of the United States is fairly efficient, it is not equal to those of England and some of the other European countries. Nevertheless the accuracy with which it delivers something like 70 million letters and other pieces of mail each day is marvelous. We hear of the miscarriage of a single letter and forget that for each one that is missent a hundred thousand are delivered correctly and promptly. As an agency for business the post office is of almost incalculable value. When a business firm mails letters it can be practically certain that every one will be delivered, even in places so remote that the mails arrive only once a week or once a month.

Another important feature of the post office is the parcels post. Although this was established only in 1913, it to-day carries an enormous number of packages. In 1921, the American Railway Express shipped about 400 million packages while the post office shipped 2600 million or about 25 for every man, woman, and child in the United States. So important is this service that some of the largest businesses in the country are mail order houses which rely almost entirely upon the post office to deliver their goods. Through their huge catalogs and the accurate service of the postal authorities, the rancher's wife in Montana or the miner's wife in Arizona or Alaska can purchase almost as easily and cheaply as can the woman who lives in the center of one of the greatest cities.

Although the telegraph is an American invention the United States and Canada have never used it so extensively as have many European

countries. At present the number of messages sent by the Western Union Telegraph Company, which is by far the largest in the United States, amounts to somewhere in the neighborhood of 100,000,000 or more per year. In proportion to the population, the one and a half million miles of telegraph wire in the United States and the quarter of a million in Canada give those countries quite as large a telegraph system as those of the countries of Europe. In proportion to area, however, France and Germany, each with about half a million miles, and Great Britain, with a quarter of a million are many times as well equipped as the American countries. Moreover, the European lines are kept busy more steadily than those of the United States. The chief reason why the telegraph is used less in America than in Europe is the greater use of the telephone in this country.

With the introduction of wireless telegraphy a new set of problems confronts the world. Here, just as in the case of the airplane, the problem is who shall use the air and how. When amateur radio operators by the thousands began to send their messages into the air it became necessary to impose restrictions so that the air should not be loaded down with messages which interfered with one another. The result has been a gradual tendency to assign different wave lengths to different types of messages. Before many years the law of the air will probably be as closely defined as those of the earth's surface.

The Telephone as an American Product.—The telephone ranks with the automobile as preeminently American. In the United States at the beginning of 1925 there were 16,072,500 telephones or approximately 14 for every hundred people, while Canada had 1,084,100 or 10 for every hundred people. The only other countries where the numbers at all approach these figures are Denmark with 8.7 telephones per hundred people, New Zealand, 8.3, Sweden, 6.7, Norway, 6.1, and Australia, 5.0. Even in so advanced a country as Belgium there are only $1\frac{1}{2}$ telephones for every hundred people. In fact, throughout much of Europe the telephone is a comparative rarity found only in the homes of the rich, in business offices, and in public places.

In the United States the number of telephones (Fig. 63) is greatest in almost exactly the same prosperous western farming sections where the automobile is most used (Fig. 21).

In Fig. 63 colored people have been omitted because it is often said that their presence is the reason why the southeastern states appear so poorly in many statistical comparisons. If they were included, it would be seen that in the southeastern states telephones are decidedly less common than automobiles, while in the northern states the difference is slight. In the North, however, the number of automobiles

per capita is reduced by the great cities so that the figure for Illinois is 6, for Massachusetts, 7, and for New York and Pennsylvania, 8. Great numbers of the poorer city people cannot afford cars. On the other hand, Illinois, Massachusetts, and New York, with their great cities each have a telephone for every 5 persons, for the cities have a larger percentage of telephones than the country districts.

One of the interesting features of systems of communication and to a less degree of transportation is the way in which they tend to become concentrated in the hands of a single company. The post office was originally run by individual companies. One reason for its nationalization was in order to secure uniform service. The express business began with numerous individual local companies, but gradually these have coalesced into a few large companies. During the Great War these were run as a single organization and to a large extent this method still survives. Each individual company has its own territory, but all work as a unit. In the same way the telegraph business is largely in the hands of the Western Union, while the only other large company, the Postal Telegraph, works in cooperation with its larger rival.

In the telephone business, even more than the others, the presence of more than one company makes a great deal of trouble. The great advantage of a telephone is that it puts everyone in the closest and easiest communication with other people no matter where they may live. Where two telephone companies are in operation, as frequently happened in the old days, there is a steady demand that the companies be united. Hence most of the smaller companies have disappeared. While the telephone companies of different parts of the United States go under different names, most of the large ones are subsidiaries of the American Telephone and Telegraph Company, the Bell System as it is called. This great system with 330,000 employees and a capital of about 3 billion dollars is distinguished by having more stockholders than any other company in the world, 500,000 at the end of 1925, of whom nearly 60,000 were employees. The number of telephone calls is about 50 million per day or 18 billion per year. In order to supply all the telephones about 40 million miles of wire are needed or more than twenty times as much as for all the telegraph lines. Judged by the number of employees and by the expenses and capital, the telephone system of communication in the United States is four or five times as important as the telegraph system. It comprises over 60 per cent of all the world's telephones.

It is hard to realize that not one of such universal conveniences as the telephone, telegraph, parcels post, post office, automobile, trolley car, railway, and steamship dates back much more than a hundred years

while in 1900 the automobile, wireless, airplane, and even the parcels post system were practically unknown in the United States. It is perhaps still more rarely realized that the use of all of these conveniences on a really large scale is still limited to a relatively small part of the earth's surface. Only in the regions of most stimulating climate and of highest civilization can all of them be found together in a high stage of development.

EXERCISES AND PROBLEMS

1. Compare the transportation and communication facilities of the United States with those of other countries. In Tables 35 and 36 decide in which columns a high figure and in which a low figure is most desirable. Make a table showing the following for each column, omitting those that are not really significant as an indication of the degree of relative progress.

I	II	III	IV	V
Figure for U. S.	Foreign country most like U. S.	Name and figure for highest country in list.	Name and figure for second highest country.	Name and figure for lowest country in list.

Use this as a basis for a written discussion of the relative rank of the United States in transportation and communication and of its position compared with the parts of the world that stand lowest or highest. Give reasons for the position of the various countries in your table.

2. Use the directions of Exercise 1 for a relative study of the transportation and communication systems of the United States as given in Tables 37 and 38. In the table and elsewhere, substitute your own state for the United States, and other states for foreign countries.

3. Let each member of the class make a map of some column of Table 35 or 36, using either symbols for value, or isopleths and shading. Compare the various maps and try to interpret them. Explain why the countries that are high in 35 B or 35 E are not necessarily high in 35 C or 35 F. What does your map show as to the United States compared with other regions?

4. Repeat Exercise 3, substituting states for countries, your own state for the United States, and using Tables 33, 34, 37, and 38. In what maps does the influence of the following factors appear most clearly and why; (*a*) cities, (*b*) relief, (*c*) general prosperity, (*d*) agriculture?

5. Choose an advanced and a backward country and discuss their systems of transportation and communication as fully as possible on the basis of Tables 33 and 36 and of good maps.

6. Repeat Exercise 5, using states instead of countries.

7. A commercial journal published in Massachusetts says that the St. Lawrence River Canal "is one of the most preposterous issues ever put before the country." It objects to it on the following grounds:

1. It is a sectional program and the ports of Boston, Philadelphia, Baltimore and New York would be "side-tracked" by ocean-going vessels from Duluth or Chicago. (What evidence of this possibility would you require to convince you?

If possible obtain data of shipments from any one of the Atlantic ports. What per cent comes from the Middle West?)

2. Navigation is closed for five months on the St. Lawrence because of ice. Is this true? (What other rivers of the world which might be used for navigation are thus handicapped? Are any of the Atlantic Coast harbors ever closed by ice? Are the navigable rivers of the United States frozen over during the winter? See U. S. Weather Bureau bulletins on Snow and Ice.)

3. While the engineering feat is not impossible, it will be costly. (What is the draft of ocean-going vessels? of Lake vessels, assuming that wharfage depth is just sufficient? How much deepening would be necessary for the Lake terminals? What differences are there between lake boats and ocean steamers?

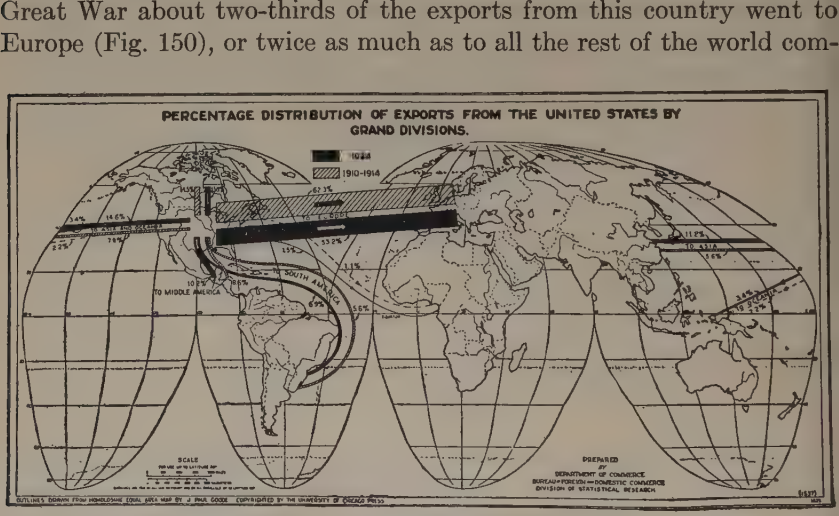
4. Under existing laws it would injure rather than help our shipping. (What are the problems of a merchant marine? What is a ship subsidy? How would our laws help English shipping in the proposed St. Lawrence waterway and hinder ours? Watch the action and discussion of Congress on this point.)

8. In your own neighborhood estimate the various kinds of transportation. lassify under the following headings the various methods of transportation in use in our community, county, or state: (*A*) ways, (*B*) vehicles, (*C*) terminals. In which these methods is the terminal an important element? The Mississippi River affic is said to be lacking in proper terminals. What is the nature of the present rminals? Why were they sufficient once, and inadequate to-day? Obtain an ccount of the Bush Terminal, New York, and compare its facilities with those of the lississippi River, or any other river which appeals to you.

CHAPTER XXVII

FOREIGN COMMERCE OF THE UNITED STATES

Importance of Europe in the Foreign Trade of the United States.—One of the most marked characteristics of the foreign trade of the United States is the extent to which it depends upon Europe. Previous to the Great War about two-thirds of the exports from this country went to Europe (Fig. 150), or twice as much as to all the rest of the world com-


PERCENTAGE DISTRIBUTION OF EXPORTS FROM THE UNITED STATES BY GRAND DIVISIONS.
1914
1910-1914
TO MIDDLE AMERICA
TO SOUTH AMERICA
PREPARED BY DEPARTMENT OF COMMERCE BUREAU OF FOREIGN AND DOMESTIC COMMERCE DIVISION OF STATISTICAL RESEARCH

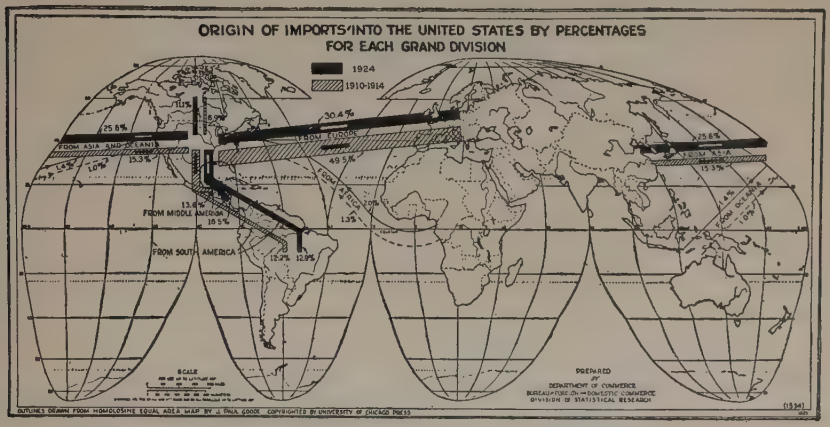
Prepared by Department of Commerce. Bureau-Foreign-Domestic Commerce.

FIG. 150.—Distribution of Exports from the United States.

bined, and half our imports came from Europe (Fig. 151). All parts of Europe by no means shared equally in the trade of the United States, for the little group of countries bordering the North Sea took seven-eighths of our exports to that continent, and supplied far the larger part of our European imports. About 200 million people in Britain, France, Germany, and their small neighbors were more important in the foreign trade of the United States than were the entire 1300 or 1400 million of the rest of the world. This fact goes far toward explaining the frequent complaints that the American business man does not satisfy the preferences of his non-European customers in South America and Asia, for example. Every business man makes the greatest effort

to satisfy his best customers, and hitherto Europe has been far and away our best customer.

How the Trade of the United States with the Continents has Changed.—The conditions which have just been outlined still prevail to a considerable extent, but important changes are in progress. These are illustrated in Figs. 152 and 153 which show the percentage of the total exports and imports of the United States sent to or derived from each of the continents from 1870 to 1924. It should be clearly understood that the total volume of trade with each of the continents is now larger than at any previous time. In the diagrams a general fall of any of the lines does not mean that the total trade has fallen off, but merely that a



Prepared by Department of Commerce. Bureau-Foreign-Domestic Commerce.

FIG. 151.—Sources of Imports into the United States.

given continent's percentage of a constantly increasing total has diminished.

From 1870 to 1890 the percentage of the exports of the United States taken by Europe remained almost stationary. From 1890 to the World War it gradually declined. During the war a temporary increase occurred because Europe produced little herself and required much from other continents. But though the Great War caused many sudden and startling changes in foreign commerce, it did not alter the fundamental geographical conditions which control the flow of goods from one country to another. Hence after the war our exports to Europe show a rapid return, not to the pre-war percentage, but to the approximate percentage that would have prevailed if the pre-war tendencies had continued without interruption. Europe now takes about half the exports of the United States, and this percentage will presumably con-

tinue to diminish. The percentage of the exports of the United States taken by North American countries shows a course almost the opposite of the European percentage. Up to the Great War it rose quite steadily; then temporarily declined, and now has returned to about the level that it would presumably have reached had there been no war. For the other continents, essentially similar conditions prevail, although the trend has been less regular.

The relative share of the continents in the imports of the United States has passed through much the same course as their share in the

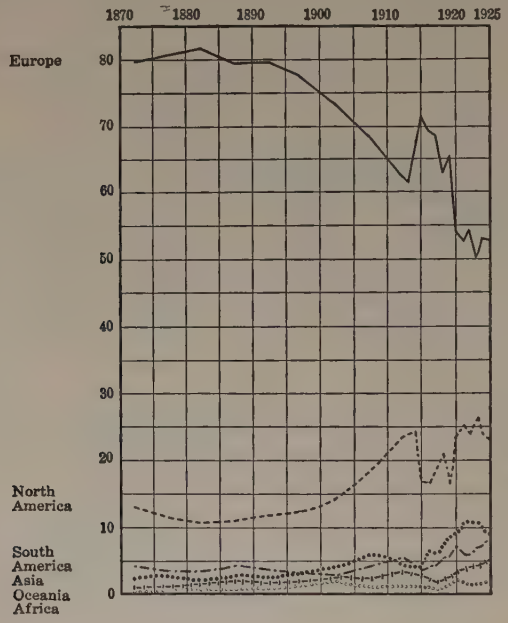


FIG. 152.—Share of the Continents in the Exports of the United States.

Percentages of total exports from the United States, 1870 to 1925. Five-year averages, 1870 to 1914, and yearly data after 1914.

exports. Europe, however, has not been so dominant, and the other continents have been correspondingly more important. The Great War had more effect upon our imports from Europe than upon our exports. Moreover, since the war the continued depression of business in many parts of Europe has prevented the imports from that continent from returning to the level that would have been expected from the pre-war trend. Thus to-day, while Europe takes half the exports of the

United States in contrast to only a quarter taken by North America and a tenth or an eighth by Asia, it provides scarcely a third of the goods imported into this country and ranks only a little above either North America or Asia.

Figures 152 and 153 illustrate certain strong tendencies which appear to dominate the foreign commerce of the United States. (1) The first, as we have seen, is a tendency toward a steady decline in the relative importance of Europe, even though that continent is still dominant. (2) Another is toward a marked increase in the importance of the North American countries close to the United States, an increase which has been accentuated by the political change in Cuba after the Spanish War, by the discovery of oil in Mexico, by the growing prosperity and buying power of Canada, and by the increasing ability of the United States to consume vast quantities of articles like sugar and tropical fruits which were formerly luxuries. (3) A third strong tend-

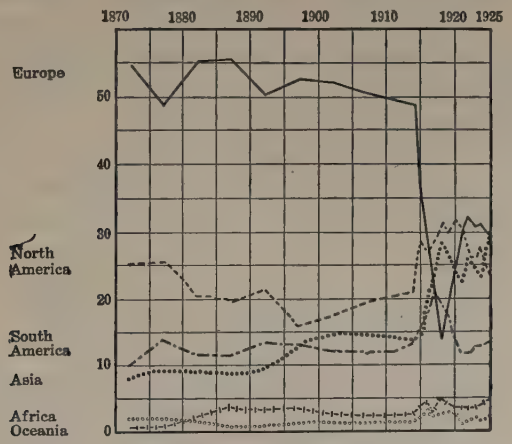


FIG. 153.—Share of the Continents in the Imports of the United States.

Percentages of total imports into the United States, 1870 to 1925. Five-year averages, 1870 to 1914, and yearly data after 1914.

ency is toward a persistent increase in the relative importance of Asia contrasted with an equally persistent tendency toward stagnation in the imports supplied by the two tropical continents, South America and Africa. In spite of all the efforts to increase our trade with South America, the percentage of imports from that continent has remained almost stationary for half a century, while the percentage of Asia has steadily risen. In 1870 South America was more important to the

United States than Asia; to-day Asia has forged far ahead. South America produces either articles like wheat and meat which the United States also produces in sufficient quantities for export, or else tropical products from the equatorial regions where it is hard to stimulate the people to produce much. Africa suffers under a similar handicap. The Asiatics are more capable of large production than are the tropical people and are also enormously more numerous.

The relative changes in the various continents are in part the result of the increasing manufacturing of the United States. This country needs raw materials which are not available in the manufacturing countries of Europe, but can be obtained from North America and Asia, and to a less degree from South America and Africa. This country wishes to sell manufactured goods, but the market for such goods in Europe is already well supplied and does not expand as in the other parts of the world. The market for manufactured goods is not expanding rapidly in tropical countries, while in the non-European temperate regions such as China it is capable of great expansion. If present tendencies should continue, it is not impossible that before many decades the business of the United States with North America and Asia may be as important as with Europe.

The Kind of Trade Carried on by the United States with the Continents.—The United States Department of Commerce divides the articles of foreign trade into five main classes according to their economic uses:

A. Crude materials, chiefly for use in manufacturing.
B. Crude foodstuffs, including food animals.
C. Foodstuffs partly or wholly manufactured.
D. Semi-manufactured materials for further use in manufacturing.
E. Manufactured goods ready for the ultimate consumer.

Figure 154 shows how the trade of each continent with the United States is apportioned among these five classes. The total trade is taken as 100 per cent in each case, regardless of whether it is large or small, and the shading indicates how much belongs to each class. Beginning on the left, over 70 per cent of our exports to South America consist mainly of manufactured goods, while another large share consists of semi-manufactured goods, leaving only about 10 per cent for foodstuffs and crude materials. Even the foodstuffs are mainly manufactured goods. In other words, we send to South America practically nothing that is not manufactured. Essentially the same is true of Africa and Asia except that we send an appreciable percentage of

raw materials to Africa, chiefly in the form of lumber and metals, and to Asia, especially Japan, in the form of these commodities together with a great amount of raw cotton. In the case of Asia the quantity of semi-manufactured materials is relatively large because of the cotton yarn and structural iron and steel sent to India, China, and Japan. One of the noticeable features of Fig. 154 is that the percentage of semi-manufactured goods varies relatively little from continent to continent. The goods sent by the United States to North American countries are distributed among the various economic classes much as are those sent to Asia and Oceania. This is natural, for the stage of civilization is about the same. Each area contains some highly progressive regions like Japan, Australia, and Canada, and also a large body of relatively backward people like the Chinese and Mexicans among whom manufacturing has as yet made little progress. The North American exports differ from those of Asia in their relatively large percentage of crude foodstuffs, as large as that of Europe. One reason is that we feed the Cubans in exchange for sugar, as described above. Finally, in Europe we find the only continent that takes from the United States a greater value of crude materials than of any other economic class of goods. Raw cotton furnishes the overwhelming bulk of such materials.

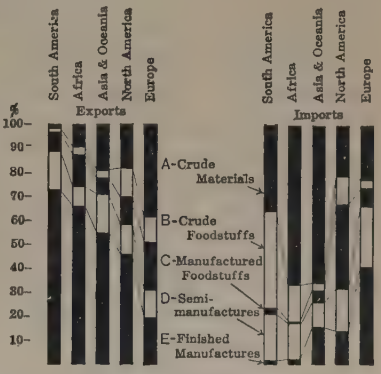


Fig. 154.—Foreign Trade of the United States in 1923 According to Economic Classes of Goods.

The right-hand part of Fig. 154 makes it evident that South America, with its coffee, sugar, fruit, and cocoa, is especially important to the United States as a source of crude foodstuffs. But its crude materials for use in manufacturing are also important, for they include unrefined copper and platinum, iron ore, nitrates, crude rubber, wool, and lumber, as appears in Table 42. Africa, Asia, and Oceania, in proportion to their trade with the United States, are much more important than South America as sources of raw material. Raw silk from Japan and China, and crude rubber from the East Indies and Malaysia are the main items of this sort. It is important to note that Asia far surpasses the two tropical continents in the percentage of manufactured goods sent to this country. Such goods, as may be judged from Table 42,

consist mainly of prosaic articles like burlaps, shellac, and cigars, although silk fabrics and decorated china play a minor part.

Our imports from North American countries are fairly evenly divided among the various economic classes, as is natural in view of the fact that a highly advanced country like Canada lies on the north and backward regions like Central America on the south. The most noteworthy feature of the North American percentages is the predominance of manufactured foodstuffs, due largely to the sugar of Cuba. Finally, the American imports from Europe show only a minor percentage of foodstuffs, both crude and manufactured, and a correspondingly large percentage of goods that are partly or wholly manufactured. The most surprising feature of the European percentages is that the shaded area for crude materials is almost as large as the corresponding area for North America. Much of the crude material from Europe, however, consists of entrepôt goods, derived originally from tropical or other countries, as in the case of leaf tobacco from the Netherlands, pearls from France, uncut diamonds from France and Belgium, and Russian or Siberian furs from many parts of western Europe. If these goods and all others were distributed to their actual place of origin, Fig. 154 would bring out even more clearly than at present the fact that, except in the case of Europe, the United States is mainly an exporter of manufactured or semi-manufactured materials and overwhelmingly an importer of crude raw materials or foodstuffs, even though the huge importation of manufactured sugar from Cuba somewhat obscures this latter relationship in the case of North America.

The Materials of American Foreign Commerce.—The relative importance of the main articles which play a part in the foreign commerce of the United States is illustrated in Tables 42, 43, and 44. Among the raw materials, exported cotton is overwhelmingly the most important. Most of it goes to Europe, especially Britain, Germany, and France, but Japan takes a tenth, as appears in Table 43. Another textile, raw silk, mainly from Japan, stands not only first among the imports, but second among all articles of commerce, whether exports or imports. Aside from sugar from Cuba, and standard newsprint from Canada, no other main article of import comes so largely from a single country, as appears in Table 44. Aside from cotton, other exports of raw material are relatively insignificant, for although tobacco and coal, or coke, exceed 100 million dollars in value per year, petroleum is worth less than 25 million. It is rather surprising to find that crude petroleum, raw cotton, and leaf tobacco fall among the 25 most important imports as well as exports.

The number of raw materials included among the chief imports

is naturally far larger than among the chief exports, for the United States is now a manufacturing country. Seven of the 18 raw imports in Table 44 are used mainly for clothing—silk for beauty; wool and furs for warmth; cotton, chiefly from Egypt, to mix with the crop raised in the United States and thus provide greater length of fiber; and hides of various kinds to protect our feet. Rubber is more important than any of these except silk. Unrefined copper and tin are primarily for the use of the manufacturer, fertilizers are for the farmer, and much of the flaxseed for the man who builds or renews his house or office and wants to have it painted.

The exports of raw foodstuffs (Table 43) consist chiefly of staple cereals,—wheat, rye, and corn. The imports of crude foodstuffs, on the contrary, have little value as food, for coffee, tea, and cocoa are merely luxuries, while the imported fish and tropical fruits are not valuable enough to be included in Table 44.

Among the manufactured food products included in our exports the great importance of animal fats and oils, chiefly lard, is notable. The fact that oil cake and meal also come into the group of 25 most important exports shows that the United States still has a relative excess of animal food, whereas Europe has a deficiency. Nevertheless, the United States imports oils to a greater value than it exports them, for the imported vegetable oils are more valuable than the exported animal oils. Even when all the other manufactured food products, both exports and imports, are added together, they cannot rival sugar in value. That product stands fourth among the articles of commerce of the United States, being exceed only by raw cotton and refined mineral oils among the exports, and by raw silk among the imports.

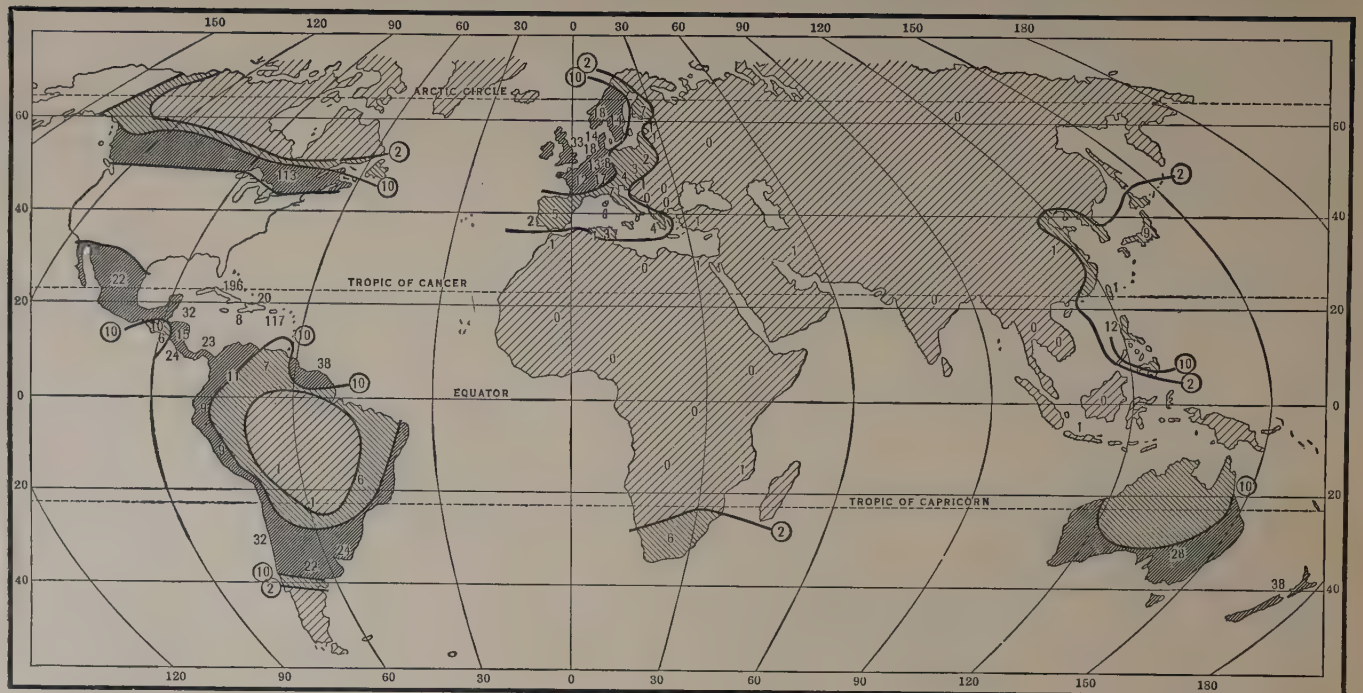
The chief exports and imports of semi-manufactured materials present an interesting contrast. Lumber, to be sure, falls into both lists because lumber is a bulky commodity which is imported from Canada and elsewhere in the eastern part of the United States and exported in large quantities from the western part. Iron and steel products and refined copper are exported in semi-manufactured form because they are produced in such large quantities that the United States can spare some for the use of other countries. But this country has now reached a point where its exports of *unrefined* metals are negligible. In the same way it exports considerable quantities of finished leather for further use in manufacturing, but does not export an appreciable quantity of hides. The main imported semi-manufactured products, aside from lumber, are evidences of the wealth and luxury of the United States. No other countries can affort to import such enormous quantities of wood pulp simply for ephemeral newspapers

which are thrown away almost as soon as purchased, or for diamonds, practically all of which are a luxury. No other country publishes huge newspapers with forty-eight or sixty-four pages in a single issue. In most parts of the world, including even countries like France, a four- to eight-page newspaper is about the normal size.

Mineral oils are by far the most important single manufactured article exported from the United States as appears in Table 43. If all kinds of machinery, however, were listed together, including not only automobiles but all other kinds such as electrical machinery and agricultural machinery, the total would be much larger than that of the mineral oils. Machinery, in one form or another, is our main manufactured export, and is likely to continue to be so. The mineral oils are almost sure to decrease as our supplies of oil become exhausted. On the other hand, the demand for machinery is increasing, for there is a growing market in countries such as Japan and India, where cotton manufacturing is increasing far faster than is the manufacture of more complicated goods such as machines. Our exportation of paper is a bad sign because it points to the wastefully rapid exploitation of our forests. The exportation of cigarettes, on the other hand, merely indicates that we have a surplus of tobacco.

The manufactured goods among the 25 most important articles of import are surprisingly limited. Cotton and woolen cloth are imported mainly because foreign countries make special types, and we import them, not because we really need them but because we like variety. Paper, chiefly newsprint, is imported for the same reasons as wood pulp, and indicates that we are very prosperous; burlap, made of jute, is needed to bag our grain crop and to do up may kinds of manufactures.

The Relative Commercial Importance of Various Countries to the United States in Proportion to Their Population.—In comparing the commerce of various countries, the differences in size make it very difficult to determine which countries are really the more active. For example, the total commerce of Norway and Mexico in 1923 was almost the same, about 360 million dollars for exports and imports together. (See Table 38.) But since Norway has only a sixth as many people as Mexico, the per capita trade was about $136 for Norway and $26 for Mexico. In other words, the relative importance of each individual in Norway, so far as foreign trade was concerned, was more than five times as great as in Mexico. So far as trade with the United States is concerned, however, the average Mexican was more important than the average Norwegian, the figures being $18.15 per Norwegian and $21.55 per Mexican. These figures represent the average amount of goods imported to the United States plus the average amount exported from



Denoyer's Semi-elliptical Projection. Drawn by Denoyer-Geppert Co., Chicago, Ill.

FIG. 155.—World Map of Trade per Capita with the United States, 1923.

Figures represent dollars per capita when imports from and exports to the United States are combined.

the United States for each Norwegian and each Mexican. Similar figures for all countries, expressed in even dollars, appear in Fig. 155.

In Fig. 155, Cuba and Canada stand highest not only among the foreign parts of North America, but among all countries. This is partly because both countries are at our very doors. In the case of Cuba, the difference between its climate and ours enables it to raise a large surplus of tobacco and sugar, especially the latter. In Canada, aside from furs, there is almost nothing which the Canadian climate favors and which is not favored by our own, but the activity of the Canadian people is equally important as a cause of trade. Their race, their climate, their stage of development, and their standards of living all cause them to engage actively in business. Both Cuba and Canada also owe part of their trade with the United States to governmental conditions, Canada because of its excellent government, and Cuba because to a certain extent it is under American protection. Finally Canada's intercourse with the United States is greatly stimulated by the common language and by the close similarity of the habits and customs in the two countries. In Cuba, on the other hand, the difference of language and customs is a handicap, although the number of Americans who know Spanish is rapidly increasing and both that country and our own are learning more of each other's likes and dislikes. The really surprising feature is not that Cuba and the United States have so large a trade, for we want Cuba's sugar and tobacco, and Cuba wants our manufactured goods and food; but that the trade of the United States and Canada should be so large when the products of the two are so similar. The trade of the two countries illustrates the fact that if people are active and have high standards of living, and are alike in language and customs, they carry on a brisk trade. In such cases very slight differences in the qualities of goods are sufficient to stimulate business. The same effect is produced when neighboring parts of two countries have different occupations. For example, the people of Ontario ship farm products to the manufacturing cities like Detroit and Cleveland, and buy machinery in return.

Porto Rico's high position in trade per capita with the United States illustrates the fact that when an energetic and advanced country assumes a protectorate over a less able and more backward one, trade is stimulated by the people of the more progressive country. In Mexico, on the other hand, the bad government which began with the fall of Diaz, together with the dryness of much of the country and the relatively low stage of development, reduced the commercial importance of the average Mexican to a low level from which the country is only slowly recovering. Only in the southern part is Mexico tropical

enough to produce many products that we cannot supply for ourselves. Its chief products (Table 42) are minerals like those which we have in large quantities. The differences between the two countries, in government, language, and habits diminish the activity of trade and partly counteract the effect of nearness. Since 1913 Mexico's petroleum trade has greatly increased the exports to the United States, but even now a million people in Mexico are not nearly so important to us as a million in Canada, Cuba, Porto Rico, or even Honduras, the Guianas, or Chile. Mere nearness is not enough to cause a large trade when other conditions are unfavorable.

In Asia, the Philippines, with a per capita trade of $12 with the United States, are the only country aside from Japan ($9) where the figure rises much above one dollar per year. This shows the great importance of governmental control. Before the Spanish War our trade with the Philippines was no greater than with other parts of the East Indies; by the time of the Great War it had become over twenty times as great as with a similar number of people in the Dutch East Indies, for example. Japan's position, second in the Asiatic list, is in part due to the location of that country on the eastern margin of Asia, where it is more accessible than any other part of the continent. Much more important, however, is the fact that the Japanese are mentally and physically the most active people of Asia. Nevertheless, the great distance of Japan from all parts of the United States and especially from the part where most of the people live, its divergence from us in language and habits, the relative poverty of its people, and the fact that its great products like cotton cloth are much like our own, cause a given number of people in that country to be less important in our commerce than the same number of people in almost any part of North America and the West Indies. Yet Japan's trade with us per capita vies with that of any part of South America except the Guianas and the three southern countries. By far the most important item is silk.

An outstanding feature of Fig. 155 is the extremely small trade per capita with China and India. Because those countries have such enormous populations, a very small trade per inhabitant makes a large total. Hence in the ordinary tables of statistics our trade with them looks large, but if we consider it in proportion to the population, it shrinks to insignificance. Because the Chinese and the people of India are far away and especially because the density of the population and the low standards of living do not permit them to accumulate much surplus, it takes 140 million Chinese to equal a million Canadians, and 310 million Indians to be as important to us as a million Cubans. Similar conditions prevail in respect to the trade of China and India

with the rest of the world, for even when their trade with all parts of the world is considered, their foreign commerce per capita stands far lower than that of any country in North America, South America, Europe, or Australia.

The fact that in proportion to the population we do over three times as much business with New Zealand as with the Philippines and four times as much as with Japan indicates that mere distance is not very important, at least when it is distance across the ocean. The voyage from San Francisco to Melbourne is 7000 miles, while the distance to Yokohama is only 5500, to Shanghai 5550, and to Manila 6300. From New York the distance via Panama to Melbourne is 10,000 miles and to Wellington, New Zealand, 8500, while via Suez the distance to Bombay is 8100, and to Calcutta, 9800. The surprisingly large trade of Australia and New Zealand shows the importance of energy, high standards of living, good government, and similarity of language and habits,—in other words the importance of the people rather than of their geographical position and resources.

Turning to South America, note the magnitude of the trade of the United States in proportion to the population of the three southern countries, Chile, Argentina, and Uruguay. The main things which seem to put these countries ahead of others are a greater proportion of European blood, the more stimulating climate of the southern part of the continent, the better health, and the higher standards of living, which result in more stable government and better habits. These conditions overcome the effect of great distances. Of course such resources as the nitrate beds of Chile and the soil and grass of Argentina are highly important; but if such resources were located under conditions of climate and civilization like those of the central part of the Amazon Basin, it would be far more difficult to use them. Language, and the form of government as distinguished from its character, seem to play a relatively small part in determining the intensity of foreign trade, for the countries of southern South America are not especially different from those of northern South America in these respects. Nor do the differences between the products of the southern countries and our own have much effect, for in this respect the northern countries are much more adapted to stimulate trade.

The trade of the United States with Africa illustrates once more the fact that business depends on people far more than upon things. The parts of Africa that stand highest in trade with the United States are those where the British and French are most numerous. Africa is potentially a rich continent, but is so handicapped by the poor health, lack of energy, and low standards of its people that its commerce is

limited. Only the most prominent and easily exploited of its great natural resources have yet been developed. In South Africa, for example, two-thirds of the surplus available to pay for imports from America depends on gold and diamonds. Even without these temporary sources of wealth, South Africa, Egypt, and French North Africa are the parts of Africa that would carry on most trade with the United States because those are the parts where Europeans are most numerous and the natives most active. Of course the trade of Africa with Europe is much larger than with the United States, for Europeans go to that continent while our people go to the corresponding regions of Latin America. In both cases a few energetic people from the north largely determine the conditions of business. The fact that Africa's trade with the United States is so small shows that even a progressive government like that of England does not overcome the racial character of the Africans. But the fact that the trade with England and the other holders of colonies is far larger than with the United States also shows that trade follows the flag.

Although Europe is by far the most important continent in the total trade of the United States, the per capita trade with us is no larger than that of the Latin American countries. The most active American trade centers at the English Channel, whence it diminishes rapidly in all directions. There many conditions combine to encourage trade, for transportation is easy, the climate is good, and the standards of civilization are high.

One of the surprising features of European trade is the way in which the per capita importance of the Swiss in American commerce rises well above that of their immediate neighbors. Switzerland is badly located for trade because it has no seacoast; it has few resources aside from its scenery; and it is hampered by the tariffs of its neighbors. Yet because its people stand high in ability and energy and have high standards not only of living but of working, so that their goods are of the best quality, a million people there are as important to the United States as 22 million in China. Another remarkable feature of the trade of Europe is the low position of Russia and the other countries of eastern Europe. A million Russians, even before the Great War, were scarcely more important in our trade than a million Chinese or Hindus; to-day they are not one-fortieth as important as a million Japanese. The distance by sea from New York to Odessa is 5370 miles, and to Petrograd 4632, so that Russia is much more accessible to the eastern United States than are Australia and New Zealand to either the eastern or western coasts of this country. Yet before the war a million people in New Zealand represented as much trade with us as did 50 million

in Russia, and to-day the corresponding figure is 165. This is not because New Zealand has more articles than Russia that we especially want, for Russia and Siberia, which are here taken together, might produce much more than New Zealand in the way of commodities such as platinum, hides, and wool. The reasons for the small trade of Russia and of the other countries of eastern Europe with the United States are found partly in the lack of energy and the low standards of the people, partly in poor government, partly in the extent to which the Russian language, customs, and ideals differ from our own, and partly in the fact that Russia is a vast self-contained continental country whose interior is not especially accessible, while New Zealand is an oceanic island with relatively few inhabitants.

In addition to this there is another important factor which has not yet been mentioned, namely the fact that other active countries like Britain, France, Sweden, and especially Germany lie nearer to Russia than does the United States. Even their trade with Russia, however, is slight, for so backward is that country that a million people in Switzerland represented as much foreign commerce with all other countries as did 24 million in Russia before the Great War and as much as over 180 million now. Other things being equal, a country deals with the nearest country where trade is active. In this fact lies the explanation of much of the disappointment of the world over America's attitude after the Great War. It was hoped that the United States would take an interest in Russia and help her to recover from the effects of the revolution. It was also proposed that the United States assume a mandate over at least a part of Turkey. But the people of America showed little interest in the matter. Because there was little trade to bind the east of Europe to America there were not many people who had an active personal interest in that disturbed part of the world. Wise people believed that it would be good for America and good for the world to have America help the Near East, and that the mere fact of a direct political relationship would greatly stimulate commerce, as has been the case in the Philippines. But geographic conditions have hitherto turned the interests of the United States so strongly to Latin America and the Far East that the Near East has been left to the countries that lie nearer. In western Europe, on the contrary, everything combines to give us an interest so great that we took part in the Great War and are still closely concerned in many important European affairs.

From this review of the present conditions and recent changes in the foreign trade of the United States, we may conclude that Europe, especially the North Sea regions, has been and still is our most active market both for buying and selling. But in proportion to the number

of people and to the rapidity with which our trade with them increases, the countries close to us in North America and the West Indies are fast assuming a position which may make them rival Europe in some respects. Australia and the southern parts of South America are also very important to us in proportion to their population. The rest of South America, on the other hand, and still more the continent of Africa, stand surprisingly low when one considers their total trade, their trade per capita, and especially the rate at which their trade increases. Eastern Asia, on the other hand, seems to promise to be one of the great trade regions of the future. Its per capita trade is indeed small, but the vast number of its people, their relatively high capacities if rightly led, and especially the rate at which trade has recently increased, seem to put Japan, China, and the neighboring islands and peninsulas of southeastern Asia in a position of great importance to the business of America.

It seems clear that the degree of activity of commerce between this country and other parts of the world depends on a combination of causes. Mere distance, or more exactly the degree of difficulty in reaching a region no matter whether it is far or near, is very important. Nevertheless, it can be easily overcome as in the case of Australia, Switzerland, and the Philippines. Australia and Switzerland both illustrate the fact that the degree of progress in a country is one of the greatest, if not the greatest, of all factors in causing active trade. The Philippines show that governmental control is likewise a factor of the first importance, while Mexico illustrates how effectively a poor government can lessen foreign commerce. The presence of products which one country needs and another can supply, as in the case of the sugar imported from Cuba to the United States, is likewise a great stimulator of trade. Other factors such as language, customs, and established habits also play a large share in determining where trade shall be active. Yet on the whole, the great determining factors seem to be the character of the people, the diversity of products, the distance from country to country or the ease with which products can be brought from one to the other, and the degree to which trade is helped or hindered by the conditions of government.

EXERCISES AND PROBLEMS

1. Use Fig. 105 as a model for a map of exports from the United States (i.e., imports of other countries from the United States, Table 38, column C). Insert one dot for each $20,000,000. Insert all oceanic trade-routes over which the United States probably ships at least $50,000,000 worth of exports each year. Begin by marking each of the 16 ports or sections of boundary whence goods worth at least

$50,000,000 are exported (Table 41). Next from Table 38, column C, mark each of the 16 countries to which we send over $50,000,000 worth of goods. Use Table 43 to help you in connecting the countries and the ports. Indicate parts of routes where traffic from more than one port converges, or from which the traffic to more than one country diverges. Discuss the relative importance of the regions and routes on your map and the reason for their differences.

2. Repeat Exercise 1, but apply it to imports instead of exports. What notable differences do you see between your import and export maps? Why?

3. Compare the total and the per capita foreign commerce of large and small countries. Select six pairs of countries, letting each pair contain one very populous country and one country not more than a quarter as large. Let each pair of countries be as nearly alike as possible in other respects. From Table 38 B and 38 G make a table as follows:

Name of Country		Imports per Capita 1923		Per Capita Excess of Small over Populous. (Use Minus Signs if the Excess is the Other Way)	Exports per Capita 1923		Per Capita Excess of Small over Populous
Populous	Small	Populous	Small		Populous	Small	

Explain your results.

4. Compare the per capita foreign commerce of tropical and non-tropical countries. Repeat Exercise 3, but let each pair consist of a tropical and non-tropical country as nearly alike as possible in size.

5. Investigate the conditions that cause various countries to differ from or resemble the United States in their foreign trade per capita. Make a list of the five countries that (*A*) stand highest in Table 38 B, (*B*) that stand nearest the United States in 38 B, and (*C*) that stand lowest. Do the same for 38 G. Explain the conditions which cause the various countries to fall into one or another of these groups. In what respects do the countries of group *B* differ from or resemble the United States? Why do they come in its class from the point of view of per capita trade? How do the countries of each group compare with the United States in internal and external transportation facilities, Tables 35 and 36?

6. Study the trade of the United States with a typical country belonging to each of the following groups: (*A*) an advanced European country; (*B*) one of the more backward European countries; (*C*) an advanced non-European country; (*D*) an independent tropical country; (*E*) a country where the United States exercises some sort of direct or indirect political control. Find out for each country all the available facts in Tables 38 to 44, in the *Statesman's Yearbook*, in some good encyclopedia, and in other available sources. Describe the nature of the products sent in each direction, that is, from and to the United States. Point out the effect of each of the controlling factors mentioned in the last part of this chapter.

7. The relative importance of foreign commerce in various parts of the United States. On outline maps of the United States insert symbols to indicate the values of imports and exports at the principal customs districts of the United States (Table 41). Why do the totals for all cities except New York fall below the total imports and

exports of New Orleans and Galveston? In this connection consider relation to other ports, density of population, ease of transportation to other populous countries, character of harbors, nature of main articles of import or export. So far as possible explain the cases where there is a great contrast between exports and imports. In Table 41 is the contrast between columns A and C always the same as between B and D? Explain.

8. Prepare an exercise to show the relation between Tables 42, 43, and 44.

9. Make a detailed investigation of the trade of Canada, as nearly as possible along the lines indicated for the United States in the preceding exercises.

10. From Table 40 make a map showing tonnage of imports to the United States by heavily shaded bars and of exports by lightly shaded bars. Use only the totals for the trade regions. Insert boundaries of regions. Note that some countries are divided between two regions. Insert the ratios between exports and imports as given after each name of a trade region. The ratio 2.8 for the United Kingdom, for example means that our exports to that region form 2.8 times as large a tonnage as our imports from there. On the other hand, 0.6 for the West Indies means exports only 0.6 as bulky as imports. Shade the regions where our exports are more bulky than our imports. Use Tables 42–44 to explain the conditions which cause either exports or imports to be more bulky in each trade region.

PART IV

THE BUSINESS OF THE CONTINENTS

CHAPTER XXVIII

EUROPE: THE MOST PRODUCTIVE CONTINENT

The Volume of Europe's Business.—From the standpoint of business Europe is the most important of the continents. In normal times no other continent rivals it in the production of wheat, oats, rye, and barley; potatoes, grapes, apples, other orchard fruits, peas, olives, and citrus fruits; flax fiber; hay, milk, cattle, horses, sheep, wool, and hides; coal and salt; and probably berries, sand and gravel, cement, and stone. In addition to its supremacy in 25 out of 58 chief products listed in Table A, Europe also carries on more manufacturing than any other continent. Moreover, 12 of the 25 products in which Europe excels are of the first rank, being produced to an estimated value of over a billion dollars each year. Even North America, which comes next to Europe, excels the other continents in only 16 products, namely, wood, cotton, corn, sugar, tobacco, and cottonseed; eggs and poultry; water power, petroleum, iron, copper, silver, natural gas, lead, and zinc. Among these only 7, including the doubtful case of water power, attain a value of over a billion dollars per year. In spite of its vast population, Asia ranks lower than North America in its production of major products. It excels, to be sure, in rice, vegetables, millet, beans, sweet potatoes, bananas, tea, peanuts, and rubber; in swine, fish, and silk; and also in tin. Six of these 13 products reach a yearly value of a billion dollars for the world as a whole. Nevertheless this is a small matter for a continent with 900 million people. The other continents are insignificant as leading producers of great products. Africa leads only in coconut and palm oil, and in gold; South America in coffee and flaxseed; and Australia in none. Thus the order is:

Europe	25	Africa	2
North America	16	South America	2
Asia	13	Australia	0

The importance of Europe is seen in foreign trade as well as in domestic production. Expressed in round numbers, the foreign trade of the continents in 1923 was as follows:

Europe	$26,000,000,000	South America	$2,500,000,000
North America	11,000,000,000	Africa	1,800,000,000
Asia	5,500,000,000	Australasia	1,500,000,000

Although Europe was greatly injured by the war, it still leads by a wide margin. Its relative position would be much reduced if we considered only the trade of each continent with other continents instead of all foreign trade, but even if we exclude the trade of each country with others in the same continent Europe remains ahead.

In transportation Europe has almost as great a supremacy as in primary production and commerce. The tonnage of ocean steamships belonging to the various continents in 1924 was approximately as follows:

Europe	37,000,000	South America	900,000
North America	17,000,000 (*)	Australia	700,000
Asia	4,000,000	Africa	300,000 (*)

If figures for canal boats, coastwise traffic, and airplanes were available they would show the importance of Europe in an even greater degree. So, too, would the mileage of improved roads and canals. In railway mileage, to be sure, North America much exceeds Europe, the figures being about 320,000 miles against 230,000. The same is even more true in trolley mileage and in automobiles. Nevertheless, in normal times the tonnage of freight carried by European railroads is about the same as by those of North America—about 2 billion tons in 1911, with an average haul of approximately 100 miles in Europe and 140 in North America. On the other hand, the number of passengers that year was only about 1100 million in North America with an average journey of 33 miles, while in Europe it was five times as great with an average journey of 25 miles. At present the tonnage carried on North American railways is about 40 per cent greater than in 1911, while the number of passengers remains almost unchanged, but the length of the average haul of both freight and passengers has increased. In Europe there has been a great decrease in all respects, but exact data are not available. Nevertheless, even in railroad traffic Europe still appears to equal or perhaps exceed North America.

Another way of estimating the business of the continents is by means of the total national wealth. This is extremely difficult to ascertain and as yet it is impossible to determine the full effects of the war. The best recent estimates are given in the following table:

* Subject to revision.

ESTIMATED WEALTH OF VARIOUS COUNTRIES IN 1914 AND 1922

Country	Approx. Deg. of Accuracy of 1914 Data *	Amount in Millions of Dollars		Approximate Amount per Head of Population—Dollars	
		1914	1922	1914	1922
Europe:					
United Kingdom	I	70,500	120,000	1540	2500
France	II	58,500	90,000	1470	2300
Germany	II	80,500	40,000 [1]	1185	670 [1]
Switzerland	IV	3,780	4,600	1000	1175
Denmark	IV	2,330	.....	855	1285 [2]
Sweden	III	4,560	.....	815	1225 [2]
Holland	III	5,100	8,300	810	1180
Belgium	III	5,850	.....	750	1125 [2]
Spain	IV	14,300	29,000 [3]	700	1375 [3]
Finland	...	.....	3,600	....	1050
Italy	III	21,800	26,000	625	665
Austria-Hungary	III	30,000	.....	590	....
Norway	IV	1,070	.....	440	655 [2]
Poland	...	.....	17,000	....	625
Latvia	...	.....	1,000	....	540
Hungary (1924)	...	.....	3,200	....	400
Russia	IV	58,500	.....	415	....
Outside of Europe:					
United States	II	204,000	320,000	2060	3000
Cuba [4]	...	.....	8,000	....	2760
Canada	II	11,200	22,200	1460	2475
New Zealand	...	.....	1,800 [5]	....	1380 [1]
Australia	I	7,450	9,700	1550	1725 [1]
Argentina	III	11,650	13,200	1660	1400 [1]
Chile	...	.....	3,100	....	800
Peru	...	.....	4,000	....	550
Mexico	...	.....	7,900	....	545
Brazil	...	.....	13,000	....	425
Japan	IV	11,650	.....	214	320 [2]
India	...	.....	22,000 [5]	....	70 [1]
China	...	.....	19,100	....	50 [1]

* Estimate is not likely to be inaccurate to a greater extent than 10 per cent in Grade I, 20 per cent in Grade II, 30 per cent in Grade III, but Grade IV *may* be inaccurate by as much as 50 per cent. Even if the actual figures depart considerably from those here given, which are taken from an article by Stamp in the Journal of the Royal Statistical Society, Vol. 82, 1919, the general result will not be appreciably altered. The estimates for 1922 are less reliable than for 1914.

[1] Probably too low.
[2] Estimated at 50 per cent more than 1914.
[3] Probably much too high.
[4] Most of the wealth of Cuba is owned by Americans.
[5] 1920.

Using this table as a basis and roughly estimating the other parts of the world, we obtain the following:[1]

ESTIMATED WEALTH OF THE CONTINENTS IN 1922

Continent	Total	Per Capita
Europe	$440,000,000,000	$920
North America	360,000,000,000	2400
Asia	215,000,000,000	210
South America	44,000,000,000	640
Africa	31,000,000,000	220
Australia	14,000,000,000	2000

The noteworthy feature of this table is that while both North America and Australia surpass Europe in wealth per person, the total wealth of all the rest of the world comes to only 664 billion dollars compared with 440 billion for Europe. Even with the reductions due to the war, Europe is probably still the wealthiest of the continents, and does the largest business.

Indirect Elements in the Business Activity of Europe.—The position of Europe in the world's business rests on ideas as well as on material factors. A large share of the world's advanced ideas are European. Although America made great contributions, France and England were the cradle of modern democracy. Although Christianity originated a little beyond the limits of Europe, the form in which it now influences the world came largely from that continent. In the same way modern education, philosophy, literature, art, and music are all essentially European. The modern sciences of physics, chemistry, geology, botany, biology, geography, psychology, and sociology likewise had their birth or at least a large part of their development in Europe. Even now the aggregate contribution of all the countries of Europe is probably greater than that of North America, or of all the other continents combined. In mechanics and machinery this has likewise been true from the time of the British invention of the steam engine down to the wireless tele-

[1] These estimates depend on the following assumptions as to per capita wealth in addition to the data given in the table. Europe: Czechoslovakia, $1000; Austria, $700; rest of Europe, $400. North America: Porto Rico, $1000; Central America and rest of West Indies, $300. South America: Uruguay, $1200; remainder, $400. Africa: South Africa, $800; Tunis and Algeria, $700; Egypt, $300; remainder, $150. Asia: all parts except Japan, $200. The estimates here given probably put Africa and South America, especially the latter, too high, because they assume a value which depends partly on the available land per person. Eastern and southern Asia rank very low in this respect. Australasia is placed higher than in the preceding table. It must be remembered that these figures are merely rough approximations.

graph and the extremely rapid improvement made by Europeans in the airplanes which the Americans, Langley and Wright, first made practical. Only within a generation or two have the contributions of non-Europeans played any large part for a thousand years or more, and even without them Europe and the world as a whole would be almost as advanced as at present.

These matters have a close bearing on business. People deal with those whom they know. Many a man passes several stores where he could buy what he wants in order to reach a store which is not a bit better, but where he is acquainted with the clerks and knows the workings of the establishment. People likewise often refuse to take a fine brand of goods of which they have never heard, and insist on something whose name they know even if it is not so good. This may be foolish, but it is human nature. In the same way a country or continent which is known everywhere for its progress in government, religion, literature, art, science, and invention attracts business. Of course the United States possesses these advantages to a certain extent, but nothing like so highly as all the countries of Europe combined. The spread of Europe's ideas does much to create Europe's business.

The Influence of Europeans on Foreign Countries.—Another way in which Europe increases her business is by sending her sons and daughters to all parts of the world. Before the war this process was going on with great speed, so that upwards of 2 million colonists went out from Europe every year. Thus Europe has peopled the United States, Canada, Australia, New Zealand, Argentina, Uruguay, Chile, and the best parts of Brazil, Cuba, and South Africa, and has furnished most of the upper classes in all the other countries of Latin America. All these places do a great deal of business with Europe simply because the present inhabitants or their ancestors came from there, their language and habits are like those of Europe, and they naturally turn to Europe both for ideas and for goods and capital.

Even more important than the colonists, from the business standpoint, are those who go to foreign lands, but expect to return "Home." Europe excels in this type of wanderers. The pioneers among them are often explorers. Such men as Marco Polo, Columbus, Champlain, and Humboldt illustrate the extraordinary ability of the men who have gone out from Europe to explore the rest of the world. After the explorer comes the missionary. The Jesuit Fathers in Canada, Carey in India, and Livingstone in Africa, were among the great missionary pioneers. These men and their modern successors have unconsciously proved among the most competent agents in opening up new lines of business for the countries from which they come.

After the explorers and the missionaries come the business men. Few facts in respect to the distribution of mankind are more significant than the way in which almost every commercial city where the people are not of European origin has its European colony. Run through such a book as *The Statesman's Year-Book*, and see how universal this is. Abyssinia is almost as remote as any part of the world, but about 300 of the 30,000 people at Dirre Daoua, the railway terminus, are Europeans. There, in almost the only independent part of Africa, the leading merchants, and the directors of the chief line of communication are Europeans. In Siam there are usually between 1300 and 1500 Europeans, chiefly in Bangkok. How influential these people are may be judged from the fact that Siam has an American as General Adviser, a British Judicial Adviser, a French Legislative Adviser, legal Advisers of various other nationalities, and British and other European officials in practically every other department of government. The metropolitan police force was much improved under the superintendence of several English police officers lent by the Government of India. The provincial police administration includes a body of Danish instructors. English and French as well as American missionaries provide educational facilities for a large number of children.

Abyssinia and Siam are among the few parts of the world aside from Japan and China which are not under the control of Europeans or Americans. Where Europeans control regions mainly occupied by other races, and even in countries like China and Japan, the European colony is almost invariably remarkable for its wealth and influence. Chinese and Japanese are indeed found in many foreign cities, and there are American colonies in places like Constantinople, Calcutta, and Shanghai, but only in a few places such as Mexico can even the Americans compare in number and influence with the Europeans. Thus Europeans penetrate almost every part of the world and form a network which helps to bind other nations to Europe.

The Loss of Europe in the Great War.—Since the Great War many authorities have feared that Europe has lost her dominance. During the war, each year's destruction was as great as the savings of four ordinary years; after the war the great waste of former savings continued for years in Russia and Turkey, while even in England, France, and Germany it was two or three years before the process of restoring the waste was well under way. Moreover, Europe lost not only material wealth which can be replaced in a few decades, but human wealth which cannot be replaced for generations. The war alone cost $19\frac{1}{2}$ million men, taken largely from the most competent parts of Europe. Of the men between the ages of 20 and 44, France lost 20 out of every

hundred; Germany, 15; and Great Britain, 10. In addition to this many million were maimed or suffered in health so that they cannot be full producers. Influenza, typhus, and other diseases probably killed 30 million people. Because of war, disease, and famine, the number of children born from 1914 to 1920 is estimated to have been about 40 million less than if peace had prevailed. Thus Europe's loss because of the war may possibly have been 80 million human beings. The direct cost of the war to Europe, as reckoned by national debts, was something like 125 billion dollars; and the indirect loss in shipping, damaged property, and loss of production is often estimated as almost as much more.

In addition to all this, the inability of Europe during and after the war to carry on business as usual and the great depression of European industry allowed Japan, and to a greater degree the United States, to capture a large part of the trade in South America, Asia, and even Africa. For example, in 1912, the United States drew 49 per cent of her imports from Europe, and 13 per cent from Asia, as appears in the following table. In 1918, she was drawing only 14 per cent from Europe and 27 per cent from Asia. In other words, before the war about half of the imports to the United States were manufactured goods from Europe, while one-eighth were raw materials from Asia. During the war the United States ceased to rely on Europe for manufactures, so that the trade in this line fell to 14 per cent. She increased her own manufactures so much that she needed twice as large a percentage of raw materials from Asia, in order to work them up in her factories. These manufactured goods she sent not only to Europe for use in the war but to other countries which Europe had formerly supplied.

PERCENTAGE OF THE UNITED STATES FOREIGN TRADE IN EACH CONTINENT IN 1912 AND 1918

Continent	Exports		Imports	
	1912	1918	1912	1918
	Per Cent	Per Cent	Per Cent	Per Cent
Europe	60	63	49	14
North America	23	20	20	31
South America	6	5	13	19
Asia	5	6	13	27
Oceania	3	2	2	4
Africa	1	0.9	1	2

Japan, as well as the United States, expanded her manufactures and thereby seized markets in eastern Asia and in the East Indies which had formerly been in the hands of Germany, England, France, and other European countries. Even in Australia, for example, Japanese sales increased as follows between 1913 and 1917:

Fabrics and clothes	$2,300,000 to	$7,800,000
Manufactured metals	34,000 to	870,000
Chemical products	630,000 to	1,780,000
Crockery and glassware	96,000 to	1,280,000
Fancy articles and jewelry	93,000 to	620,000

The Recovery of Europe.—In view of the enormous handicap under which the war placed Europe, later events are extremely interesting. In Great Britain, for example, the tremendous drop in foreign trade during the war has been followed by an almost equally sudden increase. In a relatively few years Great Britain has regained much of her old position. Her percentage of the world's foreign commerce will probably never be as large as formerly, for the United States, Japan, and to a lesser extent other countries, are not only growing rapidly in population but are learning the arts of manufacturing and commerce and are becoming able to play a part corresponding to the number and energy of their people. Great Britain forged ahead of other countries when modern manufacturing and commerce first arose, because she was helped by her supplies of coal and iron, and by the fleet which had grown up in part because she is an island. Other nations have since been catching up with her just as between the ages of ten and fifteen a small boy may become as tall as his father. The indications are, however, that within a few decades or a generation or two Britain's share of world trade will be nearly the same as if there had been no war.

The same is true of other European countries except that their speed of recovery varies according to their degree of progress. Even though France suffered terribly she seems to be moving back toward her old place with encouraging rapidity. Russia, on the other hand, had only started on the road to recovery in 1925. The upshot of the whole matter seems to be that Europe is by no means in danger of losing her business supremacy. She has been obliged to accept Japan and especially the United States as rivals, and the United States seems to be in little danger of losing her position as the most active of all countries in business. New York seems likely to vie with London as the world's financial center, but apparently the geographical conditions which we are studying in this book would have led to this result, war or no war. The war merely hastened processes which were already in

operation. It weakened Europe very seriously, but it did not destroy the geographical and racial conditions which have made Europe the most productive of the continents.

The Reason for Europe's Productivity.—We must now inquire into the causes of the activity of Europe both at home and abroad. Some of the more important of these may be classified as follows:

I. Geographical causes	1. Climate 2. Relation to the ocean 3. Relief 4. Mineral resources
II. Human causes (dependent on above)	5. Race 6. Health 7. Historical development
III. Secondary causes growing out of these	Religion Education Government Exploration Mechanical inventions

(1) *Climate.*—The climate of Europe excels that of any other continent in almost every respect. (*a*) In no other continent does so large a proportion of the area receive sufficient rain at all seasons. More than 20 inches per year fall everywhere except in the far east, the far north, central and eastern Spain, and small areas in eastern Italy and Greece. More important than this is the fact that in June, July, and August, which are the chief growing season, more than 6 inches fall everywhere except in northern Russia, where the temperature is too low for agriculture, and in the three southern peninsulas and southeastern Russia.

(*b*) Europe is peculiarly fortunate in having a large area where extremes of temperature are unknown. The northern half of the continent, as appears in Fig. 4, has no month when the temperature for night and day together averages above 70° F. The southwestern half has no month when the temperature averages below 30° F. The region where both these conditions prevail includes the whole of Great Britain, Belgium, Netherlands, and Denmark, the northern half of France, the western half of Germany, the Swiss lowland, the lowland part of Austria, a mere fringe of northern Spain, and similar fringes in the south of Norway and Sweden. Such conditions are almost ideal for human health and activity. They are also highly favorable for agriculture since farm work is interrupted for not more than two or three months in winter, the farmers are not made sluggish by prolonged and extreme heat in summer, or cold in winter, and the temperature is high

enough for a great variety of crops. Aside from a few mountain areas, which are often the health resorts of low latitudes, the only other parts of the world that have equally favorable conditions of temperature are (1) a limited strip of land on the eastern coast of the United States including Long Island and southern Rhode Island, (2) a narrow fringe, often only a few miles wide, along the Pacific Coast from San Diego to Sitka, (3) a similar strip along the coast of Chile, (4) a considerable area in the Argentine plain south of Buenos Aires, (5) the southeastern tip of Australia together with Tasmania and New Zealand, (6) the merest tip of South Africa near Cape Town, and (7) a tiny area at the northern end of the main island of Japan. These regions, it will be seen, are located in countries where civilization is high, business is active, and Europeans can thrive. All, however, are much smaller than the European area. Moreover, aside from the eastern United States, most of them lack sufficient contrast between summer and winter, and many have a long dry season in summer.

(*c*) The third great climatic advantage of Europe is its abundant storms. These not only bring rain at all seasons, but give the constant changes of temperature and of sunshine which are one of the most important elements in producing good health and vigorous activity. Among the regions with a favorable range of temperature only the eastern United States has more storminess than Europe, while Japan, the Puget Sound region, and New Zealand follow Europe but do not equal it.

(2) *Europe's Highly Favorable Relation to the Ocean.*—In the advantages of its relation to the ocean Europe stands in a class by itself. These advantages arise partly through climate and partly through transportation. Climatically the first important feature is that Europe lies east of an oceanic region in which the warm Atlantic Drift penetrates to an unusually high latitude through the opening to the Arctic Ocean between Iceland and Norway. In winter this causes the air over the ocean west and north of the British Isles to be 30° F. or even 40° F. warmer than the average for the corresponding latitudes over land and sea together. The prevailing westerly winds of these latitudes not only are warmed by the water but bring a high degree of humidity to the land and thus prevent the temperature from falling unduly low even at a distance of hundreds of miles inland, especially in the northern half. They also increase the winter rainfall, especially in the south.

The oceanic effect is intensified by the North Sea and Baltic arm of the ocean, extending eastward about 1200 miles from the open ocean, and the Mediterranean and Black Sea arm, about 2500 miles. The effect of these conditions, joined with the comparative absence of

mountains along the coast of western Europe, is evident in the following comparison of Leningrad with Chippewyan, which lies in nearly the same latitude on Lake Athabasca in northern Canada.

Month	*Chippewyan*, Athabasca. 59° N., 111° W. Altitude 650 Feet	*Leningrad* 60° N., 30° E. Sea Level	Amount by which Leningrad is Warmer than Chippewyan
January	−16°	15°	31°
February	− 9°	17°	26°
March	4°	24°	20°
April	28°	36°	8°
May	45°	48°	3°
June	56°	59°	3°
July	62°	64°	2°
August	56°	61°	5°
September	45°	52°	7°
October	33°	40°	7°
November	14°	29°	15°
December	1°	20°	19°

Both places are about 800 miles from the open ocean. The slightly more northern latitude of Leningrad almost compensates for its slightly lower altitude. Yet in midwinter the temperature of Leningrad averages 31° F. higher than at Chippewyan; at Leningrad the ground thaws in April and is not frozen again till November; at Chippewyan the ground does not become soft till May, while early October sees it frozen once more. Moreover, Leningrad, with 20 inches of rain, has about half as much again as Chippewyan.

Such conditions of relative warmth and abundant rain prevail over most of Europe, but diminish toward the east and south. Hence, most of Europe has relatively mild winters which do not have an unduly depressing effect upon either health or agriculture. The northern position of the continent gives it fairly cool invigorating summers, while the long days in such high latitudes give sunshine and warmth enough for agriculture. Only in southern Europe is there anything to compare with the steady heat which makes the city of Washington, for example, a place which many people dread in summer. Even in southern Europe the presence of the Mediterranean sea lowers the summer temperature somewhat and helps to prevent Italy and Greece from being deserts.

The advantage of transportation which Europe derives from the sea arises partly from the way in which two great oceanic arms and many minor bays and gulfs penetrate inland. The only other regions which

compare with Europe in this respect are (1) the Caribbean region, including the West Indies and the lands around the Gulf of Mexico and the Caribbean Sea, and (2) the far eastern region, including the East Indies, the Japanese Islands, the Malay Peninsula, and the coasts of Indo-China, China, Chosen, eastern Siberia, and northern Australia. If water transportation alone gave preeminence in business, these two regions might rival or surpass Europe. As it is, Europe's facilities for transportation by water confirm the advantage given her by climate. No part of Europe outside Russia is more than 400 miles from the sea, and most parts are within 200 miles. So valuable are the oceans as waterways that goods from all parts of Germany except the immediate Danube valley can be shipped to Bulgaria and the other Balkan states more cheaply by sea than by rail or even by the Danube waterway. Such conditions help to account for the extraordinary development of Europe's coastwise traffic. They give her cheaper transportation than the United States without the enormous expense of such a dense railway net.

(3) *How the Relief of Europe Favors Business.*—A physical map of Europe shows (*a*) a northwestern highland embracing chiefly Scotland and Scandinavia, (*b*) a great central plain whose western outliers are in Ireland, southern England, and western France, and which extends eastward through Belgium where it is narrowest, to Germany, southern Scandinavia, Poland, and especially Russia where it broadens to great size; (*c*) a central system of mountains beginning with the Pyrenees, continued in the Alps and Carpathians, and ending in the Balkans and the Caucasus; and (*d*) three southern peninsulas one of which has a southwestern trend, while the other two trend southeast.

In comparison with the other continents this system of relief is highly favorable. Lines of transportation, as we saw in Chapter XI, tend to converge on the greatest centers of activity and population. Although railroads try to avoid mountains, many great trunk lines run athwart them in order to connect active centers like Philadelphia and Pittsburgh, the Atlantic and Pacific Coasts of the United States, or Argentina and Chile. But in Europe many natural routes lead toward a single center. That center is the southern part of the North Sea in the midst of the world's largest area of healthful, stimulating climate, a place where three races meet and blend, as we shall shortly see. Within 300 miles of this center the number of great cities is many times as large as in any equal area in any other part of the world. From eastern Europe, the Russian plain narrows westward so that the traffic is concentrated between the Baltic Sea and the mountains of southern Germany, and tends to reach the ocean on the shores of the North Sea.

Farther north, the two branches of the Baltic direct the trade of their coast toward the North Sea, and the Kiel Canal gives a direct water route to the Straits of Dover. Another great stream of traffic comes eastward across the Atlantic or northward along the coast of Africa. Part of the traffic is diverted into the Irish Sea to Liverpool, or into the Bay of Biscay to Bordeaux, but far the larger part crowds into the English Channel and passes the Straits of Dover.

From eastern and southern Asia, from Australia, the East Indies, and the east coast of Africa, the traffic is drawn as by a magnet toward the intense commercial and industrial activity of the North Sea region. Passing through the Suez Canal, the traffic finds it easier to make a detour by water to the west through the Straits of Gibraltar rather than travel overland; most of it keeps steadily on its way to the North Sea region. A small side stream flows up the Adriatic Sea to Trieste and Fiume where the low mountains allow it to pass over to Vienna on the outer edge of the region of greatest activity. A somewhat larger portion stops in Italy. At Marseilles another portion seeks the land, but part of even this moves up the Rhone Valley, another of the natural channels which lead toward the North Sea region.

Inland waterways as well as land routes and ocean waterways converge upon the regions near the North Sea. The Seine and Marne, the Rhine, Elbe, and Vistula all flow in general toward the North Sea center. The more directly they flow in this direction, the heavier their traffic. The Rhine in proportion to its size is the greatest long-distance carrier of traffic among the rivers of the world. Thus the topography of Europe, more than that of any other continent, invites traffic toward the regions of greatest activity.

(4) *The Good Fortune of Europe in its Mineral Deposits.*—The parts of Europe near the North Sea are among the most favored regions of the world in mineral resources as well as in climate, oceanic relations, and topography. Scattered here and there on the borders of the British plain with outliers in southern Scotland and northern Ireland, are deposits of fine coal. The formations which contain this coal appear to extend eastward under the North Sea, for they reappear in Belgium, northern France, the Saar Basin, and the German Ruhr coal field near Dortmund and Essen. Farther east the great manufacturing centers of Chemnitz, Breslau, and others depend on neighboring coal fields, while in upper Silesia, where Germany joins Poland and Czecho-Slovakia, lies another coal region. Still farther east, in the Donetz Basin north of the Sea of Azov the same general formation reappears. Aside from this interrupted band extending roughly from Wales to southern Russia there is little good coal in Europe, that near Moscow for example being

of poor quality. Not far from the coal, especially in Britain, France, Germany, and Russia, lie deposits of iron. This combination of the two most valuable minerals in the very region where the other main geographical conditions are most favorable has been an extraordinary stimulus to manufacturing and transportation.

Although Europe is relatively poor in mineral resources aside from coal and iron, those which it possesses are well exploited. The northwestern mountains seem to contain practically no ores except the fine iron of northern Sweden. The southern peninsulas contain the iron of northern Spain and a great variety of other minerals. These other minerals have been so well developed that Europe, including the Ural Mountains, provides about four-fifths of the world's pyrite, potash, and magnesite, over half of the mercury and graphite, and approximately two-fifths of the aluminum, platinum, salt, bauxite, saltpetre, and zinc. These, however, are of small importance compared with the fact that normally Europe produces about half the world's coal and iron. No other region of similar size has so fortunate a combination of a fine supply of coal and iron, a climate good for both man and agriculture, abundant level lands of fair fertility, a relief which concentrates the lines of transportation upon the very region where the climate, relief, and minerals are most favorable, and wonderful facilties for ocean transportation which bring the trade of the world to the area where the other geographical advantages are concentrated.

(5) *The Commingling of Races in Europe.*—To the physical advantages of Europe must be added those of race. Most people think their own race the best. They also suppose that racial inheritance can overcome the effects of a bad environment indefinitely. How far this is true is not yet known, but one or two things are clear. The European or white races almost certainly inherit greater mental capacity than the aboriginal red race of the Americas, or than the black races of southern Asia and Australia. How the inherited capacity of the white races compares with that of what are sometimes called the brown races including the Arabs and Hindus, and of the yellow races including the Chinese and Japanese has not definitely been determined. This much, however, seems fairly certain; the European races have now for a long time had the advantage of a better physical environment than any others except perhaps the Japanese. This environment has played a part in giving them the advantage of unusual racial energy and alertness. Nevertheless there are marked racial differences in different parts of Europe. Fair-haired, aggressive Nordics, the kind of people who seem to have the strongest tendency to make inventions and plan great schemes, predominate in Scandinavia and all the regions bordering the

North and Baltic Seas. Broad-headed Alpines, a people who are generally regarded as patient, persistent, and relatively quiet, occupy most of Russia, the Balkan regions, and the highlands of central Europe. They are the kind of people who, when once an idea has been proposed or a plan of operations has been started, have special capacity to carry out its details and to stick to the often tiresome repetition and regulations which are necessary to bring an idea to its perfect fruit. Farther south, the three peninsulas and also the western parts of France and Britain contain an unusually large proportion of dark Mediterranean people among whom the poetic and artistic temperament is unusually common. To a high degree they have the capacity for enthusiasm and for making friends.

In the regions within a radius of four or five hundred miles of the Strait of Dover these three races are mingled more than almost anywhere else, unless it be in the United States. In the European region all three of these highly competent races enjoy the stimulus of unusually favorable geographical conditions, and hence have good opportunity to make their special contributions to human progress. Thus the favored North Sea region has a peculiarly strong racial combination which adds another to the complex series of reasons why this region leads in so many activities.

(6) *The Contribution of Health to European Business.*—Another marked characteristic of Europeans is their energy. In Chapter IX we saw that health is one of the most important conditions for active business. We have also seen not only that Europe as a whole is the most healthful of the continents, but that the region around the North Sea is probably the most healthful in the world aside from certain small areas such as New Zealand or parts of the Pacific Coast of North America. Because of the climatic conditions the people would apparently be unusually strong and well even if there were no such thing as modern medicine. But the very fact that they possess energy makes them more ready than most people to profit by advances in medicine and sanitation. Unfortunately the Great War produced an enormous amount of disease and death, and the semi-starvation which afflicted scores of millions of people year after year has caused millions of children to grow up with impaired physiques. This condition is worst in relatively backward countries like Russia, but it played a part even in France and Germany. Nevertheless, to-day as for centuries, especially in the region around the North Sea, a part of Europe's strength is due to the fact that her people are healthy enough to work hard and to work intelligently.

(7) *The Part Played by Historic Development.*—The vigor of the Europeans has enabled them to profit by a vast number of his-

torical events which elsewhere could not have produced such great fruits. Thus the Europeans have profited greatly from Christianity. They had the strength of character to accept the Christian ideas of responsibility for one's neighbors, and of honesty as the best policy. Hence, in spite of many failings, Europe maintains high standards in business. A business man whose dealings run into millions of dollars each year remarked, "I deal with half a dozen nations. From others I want a written contract, but from an Englishman a letter is enough, and with a Hollander a memorandum in his own pocket suffices." This estimate of racial honesty is probably fair. It is highly significant that the two nations that are most active commercially are the two that are most honest. Again, the physical, intellectual, and moral strength of Europe makes her more able than other parts of the world to profit by the wisdom of men of genius. It required people of high average ability to understand and perpetuate the work of such men as Shakespeare, Galileo, Columbus, Stevenson, and Darwin. Elsewhere many geniuses may have left little mark because they lived among people who could not carry on their work. Of course all this applies to people of European race in other continents, but they are part of Europe in the sense that their inheritance comes from that continent.

The importance of men of genius cannot be too strongly emphasized. If backed by competent disciples they give a country a start which is an almost inestimable advantage. Such men in the North Sea regions invented and perfected most of the modern methods of transportation, communication, manufacturing, and commerce. At once the people took them up and improved them. Thus in almost every line western Europe got a start ahead of its competitors. The United States was a little slower in starting, Japan still more so, and other nations are as yet mere beginners. For a time all sorts of business activities may increase in other countries more rapidly than in Europe, just as a child of two may grow much faster than one of twelve. But Europe has already grown to be such a giant in business and the advantages of a good start are so great that no other continent can easily overtake her. It is a calamity not only for Europe but for the world that the Great War wrought most havoc in the very regions where progress has been most rapid. The same thing has happened in the past, for some of the worst wars in former days were those where the dominant civilizations of their day clashed, Babylonians with Chaldeans, Assyrians with Egyptians, Greeks with Persians, Athenians with Spartans, and Romans with Carthaginians. In all these ancient cases the fighting produced terrible results from which one or both the contestants never recovered. Whether the same thing will happen today no one can tell. In some respects recovery has indeed been rapid, but in others the full

consequences of the war may not be evident for generations. But one important factor is different now from what it ever was before: Never in the past, so far as we can tell, was there a region which equaled the regions around the North Sea in its combination of climate, ocean, relief, minerals, races, health, and a background of historic achievement on which to build a progressive future.

EXERCISES AND PROBLEMS

1. Compare the cities of Europe with those of the rest of the world. Divide the large cities of Tables 4 and 6 into three groups: (*A*) over one million population, (*B*) 500,000 to one million, (*C*) 300,000 to 500,000. How many has Europe in each group compared with each of the other continents and with all the others combined?

On an outline map of the world indicate the location of the cities of the three groups noted above, using symbols of three different sizes. In what regions do you note a pronounced grouping of great cities? How does the European group compare with the others? Explain its location.

2. Compare the production and possessions of Europe with those of the rest of the world in as many respects as possible. In Tables 1, 11, 13, 22, 23, 26, 29, 35, 36, 38, and 39, let the class divide up the various columns (except those labeled per capita, percentage, per thousand, per acre, etc.). Obtain for each column the total for each continent and for the world. Reduce the continental figures to percentages of the world total, and make from the percentages a table showing the relative rank of all the continents in as many lines of production as possible. In which does each continent rank first? How do your results compare with the statements in the text?

3. Study the problem of Exercise 2 in another way by picking out the highest country or state in the tables where some activity is expressed as a percentage, per capita, per acre, etc. Use Tables 9, 12, 14, 23, 29, 35, 36, and prepare a table on the following model:

RELATIVE ACTIVITY OF THE CONTINENTS

I. Name of Country or State Standing First. II. Standing of Highest Country or State.

Condition or Activity	Table and Column	Africa		Asia		Australia and E. Indies		Europe		North America		South America	
		I	II	I	II	I	II	I	II	I	II	I	II
Per cent of Arable Land . .	9, A	Tunis	25	India	59	Java	43	Denmark	62	Porto Rico	25	Argentina	17
Corn per Capita.	12 II, A	South Africa	6.6	Philippines	1.5	Queensland	3.3	Rumania	8.9	U. S.	25.9	Argentina	24.8
Wheat per Capita.													
Oats per Capita.													

Let each member of the class copy the table and prepare a written report as to the general type of activities or conditions in which the various continents stand highest, and as to the relative position of Europe.

CHAPTER XXIX

THE BUSINESS OF EUROPE

The Centers of Activity.—Individual occupations, as well as civilization and business in general, have certain centers where their development is especially high. In Europe, agriculture, for example, has such a center in northern France from Normandy northeastward along the English Channel to Belgium. A few hundred or a thousand miles away the intensive farming and market gardening of this region give place to one-crop agriculture, cattle and sheep raising, irrigation, fishing, and lumbering. In other occupations a similar change takes place as one travels away from the European centers of high development. Western Germany serves as an illustration of the most highly developed mining communities, for nowhere else is coal more thoroughly utilized. In manufacturing, England seems to have the strongest claim to be reckoned as the main center, for factories are there developed to an extraordinary degree. Transportation and commerce comprise another great group of activities which are most highly developed in certain centers and decline outward. The Netherlands stand very high in this respect. Such activities as government, religion, science, art, and literature likewise reach their highest development within three or four hundred miles of the Straits of Dover. If the area of greatest activity were not divided among three great nations and several small ones, all speaking different languages and all more or less jealous of one another, its supremacy would be still more evident.

The European Center of Agriculture.—Let us consider the agriculture of Normandy, Picardy, Artois, and Flanders, a region extending roughly from Le Havre and Paris on the southwest to Brussels and Bruges on the northeast. In spite of the ravages of war, this Franco-Belgian area, no larger than Massachusetts, is one of the fairest districts in the world. The following table shows how many of the crops and animals mapped in Finch and Baker's admirable *Geography of the World's Agriculture* are produced abundantly in this area. Two stars mean abundant production, one star moderate production, and no star no production worth mentioning. The stars in parentheses after the designation Ill. refer to an area equal to the Franco-Belgian area and extending east and west across the richest part of central Illinois.

AGRICULTURAL PRODUCTS OF THE FRANCO-BELGIAN COASTAL STRIP FROM NORMANDY TO FLANDERS

(1)** *Wheat.* Fig. 3. In proportion to its size the little Franco-Belgian coastal area produces more wheat than almost any other part of the world. France, as a whole, although smaller than about 30 other countries or regions for which the statistics are published independently, stands sixth in production of wheat (Table 11). It has a greater percentage of its cropped land in wheat than has any other country, and produces more per square mile than any other countries except Egypt, Hungary and Italy (Table 12) ..... (Ill.**)

(2)* *Rye.* Moderate amount, but more than in almost any part of the United States or England

(3) *Corn.* None, summers too cool ..... (Ill.**)

(4)** *Oats.* More abundant than in almost any other region except central Illinois and northern Iowa ..... (Ill.**)

(5)* *Barley.* Small quantities, a crop of relatively unfavored regions

(6) *Sorghum and Millet.* None, too cool ..... (Ill.*)

(7) *Rice.* None, too cool

(8) *Cotton.* None, too cool

(9)** *Flax.* Abundant, especially in Belgium. France stands eighth among the countries of the world in the production of the fiber

(10) *Hemp.* Practically none

(11)** *Tobacco.* Abundant, especially in Belgium. France stands twelfth among the countries of the world, and third among the countries of Europe

(12)** *Potatoes.* More abundant than in almost any part of the United States except Aroostook County, Maine ..... (Ill.*)

(13)** *Sugar.* Very abundant. France ranks tenth among all sugar-producing countries and fourth among those producing beet sugar

(14)** *Apples.* Abundant, especially in south ..... (Ill.**)

(15) *Peaches.* Few, summers too cool ..... (Ill.**)

(16) *Grapes.* Few, summers too cool

(17)** *Pears, plums, cherries, berries.* Abundant and varied ..... (Ill.**)

(18) *Citrus fruits.* None, too cool

(19) *Olives.* None, too cool and damp

(20) *Coffee.* None

(21) *Tea.* None

(22) *Sweet potatoes and yams.* Few or none

(23)** *Vegetables.* Very abundant. Data for separate kinds not available. (Ill.**)

(24)** *Dry beans.* Abundant

(25)* *Dry peas.* Fairly abundant ..... (Ill.*)

(26)* *Buckwheat.* A little ..... (Ill.*)

(27)** *Hops.* Abundant

(28) *Kafir and milo.* Not raised, too cool

(29)** *Hay and forage.* Great quantities ..... (Ill.*)

(30)** *Root forage.* Large quantities ..... (Ill.*)

(31)** *Horses.* Very abundant. Percherons originated in Normandy ..... (Ill.**)

(32)* *Mules and asses.* A moderate number ..... (Ill.*)

(33)** *Cattle and dairying.* Very important, especially in Belgium ..... (Ill.**)

(34) *Buffaloes and carabao.* None
(35)** *Swine.* Abundant, especially in Belgium..... (Ill.**)
(36)** *Sheep.* More abundant than in any part of U. S. except Ohio..... (Ill.*)
(37)* *Goats.* A moderate number
(38)** *Poultry.* Very abundant..... (Ill.**)

The climate of northern France of course forbids the cultivation of many of the 38 products which the experts of the United States Department of Agriculture have included in their atlas of agriculture. Nevertheless, 18 are raised in great abundance, 6 in moderate abundance, and only 14 are negligible. In an equal area in central Illinois, almost the best agricultural region in the United States, 12 are raised abundantly, 8 moderately, and 18 are negligible. Both regions produce an abundance of wheat, oats, apples, vegetables, horses, cattle, and swine, but northern France also produces an abundance of 11 other products and central Illinois of only 5.

The Farms of the Franco-Belgian Center of Agriculture.—One noticeable feature of the Franco-Belgian region from Normandy to Flanders is the luxuriance of the vegetation. In Normandy, according to a local proverb, "grass grows so fast that it pushes up the cattle, and a stick lost in the grass in the evening cannot be found next day."[1] In the interior of Flanders, "thick hedges, rows of trees in imposing avenues, clusters of elms about the houses, groves on the less fertile portions, adorn the countryside, half concealing it beneath a veil of green." The pastures are chiefly meadows where horses, cattle, sheep, and swine are seen at certain seasons. But so intensive is the cultivation that for a great part of the year the animals are stall-fed, the crushed fibers of the sugar beet being one of the most nutritious foods. Whether the animals are in the meadows or clustered around the barns, they are always present on practically every farm. The farmers have learned the lesson of preserving the fertility of their land not only by rotating the crops, but by keeping many animals. Hence, the soil is still rich after hundreds of years of cultivation. Much of the time on a tour among the farms one feels as if riding on park roads through a market garden. There are few ragged edges such as abound in America, no bushy pastures, no desolate "cut-over," hillsides where the forest has been slashed down. Each field is devoted to some useful crop; each patch of trees is carefully cultivated and pruned, the best trees for lumber being cut at intervals without spoiling the young trees that are not yet ready.

There are not trees enough to warrant wooden houses or even many wooden sheds. So most of the buildings are of brick or sometimes

[1] Blanchard and Todd: Geography of France.

stone, which gives a substantial, permanent appearance. And appearances conform with facts, for outside the war-stricken areas probably half the people live in houses built a hundred or more years ago. According to American ideas many other features are somewhat old-fashioned. For example, the small fields are cultivated by hand more than by machinery. Nevertheless, for intensive, profitable cultivation, for purposeful industry, and for real comfort and pleasure few parts of the world exceed this garden spot at the center of European agriculture.

How Agriculture Changes Outward from the Franco-Belgian Center. —Northwestward across the Channel in southern England the country is almost as thoroughly cultivated as in northern France, although the variety of crops decreases. There are less rye and oats, while barley is more plentiful. Flax, tobacco, the sugar beet, and goats almost disappear, but roots for animal forage become more noteworthy. In other words, while the farming is still of the same intensive type, it becomes less varied. Yet in yield per acre England often surpasses France, though not Belgium.

In Ireland, where the winters are warmer, the summers cooler, and all parts of the year damper than in France, the type of agriculture changes. Oats are the only really large cereal crop, and potatoes the one great crop in the vegetable group. Certain places, indeed, cultivate considerable wheat, rye, barley, and flax, but these are of minor importance compared with either animals or the hay and forage which they consume. The Irish Free State, with 156 cattle, 111 sheep, 43 swine, 12 horses, 8 asses, and 7 goats per square mile, has more animal units in proportion to its area than any other country except Denmark and the Netherlands. Unfortunately, it suffers from one-crop agriculture. Many Irish farmers rely largely on potatoes, oats, and cattle. The country is so moist, swampy, and cloudy, that highly diversified farming is difficult, and economic distress is common.

Northward as well as northwestward from France the importance of animals increases and the number of crops declines. In the Netherlands and Denmark this does little harm, for the cultivation is so intensive and cooperation so well developed that there is great prosperity. In southern Norway, however, where the cool summers limit the chief crops to oats, barley, potatoes, and hay, the dangers of one-crop agriculture are always present, in spite of relatively large numbers of cattle and sheep. But the Norwegians, unlike the Irish, largely supplement their agriculture by fishing, and by acting as carriers of commerce for other nations. Norway has more shipping tonnage per person than any other country in the world. North of the southern fringe of the country, crops cease to be profitable, and the Norwegians

rely almost wholly on seafaring occupations or on cattle which they drive back and forth from seacoast to mountains according to the season. Across the Scandinavian peninsula to the east where the mountains shut out part of the oceanic winds and moisture, great forests flourish in the cold but relatively dry parts of Sweden bordering the Gulf of Bothnia. There the people not only cut wood but make it into furniture and other useful goods. Almost everywhere in Scandinavia the houses are made of wood, in strong contrast to the brick and stone of England and central Europe. In the far north the cold, stormy climate makes even lumbering and cattle raising impossible. There the Lapps rely on reindeer, or on fish caught close to the shore.

Returning to northern France and proceeding nearly northeastward toward Berlin and Moscow, we at first find little change in agriculture and other forms of primary production. In central Germany most of the crops are like those of northern France except that rye, potatoes, root crops, barley, and swine are of greater importance, while fruit and vegetables decline, as befits the colder winters. Farther east in Poland, a harmful tendency toward one-crop agriculture begins. Around Moscow this is so strong that many a farmer plants only rye and oats with perhaps a small field of flax or potatoes. Animals are relatively much less numerous and varied than farther west, and the fertility of the fields is not well kept up. This tendency toward limited crops is due partly to the long, cold winters and short growing season, but has been much intensified by the communistic system of landholding. For many generations the land belonged to the villages and not to individuals. The farmer was never sure how long he would hold his land, and so took little pains to improve it. Under the Bolshevist régime this tendency was intensified, for the farmers not only had no ownership in the land, but were not even supposed to own the crops. The one-crop type of agriculture as practiced on the rye farms of middle Russia leads to hard times, poverty, ignorance, and apathy not only because of poor crops, but because the diet is one-sided, lacking the vitamines and other necessary elements provided by fruit and vegetables.

Let us next proceed eastward or a little south of east from the Franco-Belgian center of agriculture. There the change in agriculture is slower than in any other direction, for the climatic change is also slow. Thus southern Germany, western Czecho-Slovakia, and the lowlands of Austria have an intensive type of varied agriculture almost equal to that of northern France. Farther east in Hungary and Rumania the warm continental summers cause corn and grapes to be prominent farm products. In fact, so far as variety of products is concerned, Hungary outranks northern France. Nevertheless, the care with which agri-

culture is carried on begins to diminish. Even in Hungary this is manifest in the concentration on cereals. Wheat and corn in nearly equal amounts occupy over half the cropped land, and rye, barley, and oats another quarter. Fruit and vegetables occupy less space than in northern France; there is more waste land, less attention is paid to the manuring and fertilization of the soil, less care is given to rotation, and there is a greater tendency for the farmer to cultivate one or two especially profitable crops rather than a great variety. At the same time the total number of domestic animals increases in proportion to the population.

In Rumania and southern Russia these tendencies become much more pronounced. A farm tends to become merely a place where three crops are rotated, wheat or barley, hay, and one other, with almost no trees, few vegetables, and almost no small fruits, aside from grapes. Fields of corn, potatoes, rye, oats, flax, and tobacco are indeed seen here and there, and in the region around Kiev sugar beets are raised in great abundance, but these are not the rule. The proportion of cattle, horses, sheep, and swine increases greatly compared with the number of inhabitants, but because of the relatively low density of the population, the number of animals in a given area is less than in western Europe. The care which the animals receive is much less than farther west. In fact lack of care is evident everywhere; the houses are smaller, less comfortable, and less neatly cared for; and there is much more tendency to leave things lying around at loose ends in the yards and outbuildings than in northern France.

These conditions arise in part from the fact that not only is the climate less healthful there than farther west, but summer droughts and crop failures join with the conditions of land tenure and government in discouraging initiative. Indeed in the wheat region of southeastern Russia, from longitude 35° eastward to the lower Volga, droughts frequently reduce the peasantry to destitution, and bring on the horrors of famines, like those of 1890, 1898, and the terrible days of 1921. In this dry, treeless land, flat-roofed houses of adobe are common. Still farther to the southeast, near the Caspian Sea, the increasing dryness gradually causes agriculture to give place to nomadic cattle raising except near the Caucasus Mountains where water is available. In the Balkans, likewise, the proportion of animals compared with men increases. Here, as in every other direction, the final result of the gradual modification of the climate is a tendency toward a full-fledged one-crop type of agriculture and then toward communities which rely on animals rather than plants.

Southeastward, southward, and southwestward from northern

France this tendency attains its full results only in the deserts of North Africa. In Europe, a distance of a few hundred miles from northern France drives flax, sugar beets, and root forage almost out of the farmer's list of products. In southern France, rye, oats, and barley are also scanty; but potatoes are still abundant, corn occupies an important place, vegetables and grapes are raised in profusion, and, olives attain importance. There and in the northern parts of Italy, and to a less extent in Spain, intensive agriculture is still the rule, and the farms are not only beautiful because so well cultivated, but because of the variety of the crops and the abundance of trees. Horses and cattle, however, become less numerous except in the Po Valley; swine lose much of their importance; while sheep and goats are not raised in any such numbers as farther south. Hence, northern Italy has few domestic animals. Farther south, as befits the dry climate, intensive agriculture continues in the well-watered portions such as the western parts of the peninsulas of Iberia, Italy and Greece, and in all other regions where irrigation is feasible. In such regions broad fields of a single crop are often replaced by areas where many kinds of trees grow intermingled with vines or separated by little patches of crops. This type of cultivation betokens less care than where each crop is treated separately, with due thought as to the best conditions of moisture, sun, and soil. Carried to an extreme, it becomes the haphazard agriculture of the torrid zone where everything is left to chance.

In the drier parts of central and eastern Spain and Italy, and in most of the Balkan Peninsula, full fledged one-crop agriculture again appears. Winter wheat and barley are the staples, for they ripen early enough to escape the long summer drought which burns up every green thing that is not irrigated. Sheep, and in the Balkan Peninsula goats, become the chief animals, while in Spain, Greece, and the Balkan countries a certain number of the sheep-keepers become nomadic, at least during the summer. Thus here, as on the other borders of Europe, extreme conditions of climate put an end to intensive and highly varied farming, and lead to one-crop agriculture with its danger of famine and distress, and to cattle or sheep raising with its sparse population and its nomadic and unsocial tendencies.

How Europe's Production and Use of Minerals Vary from Region to Region.—Europe has long been the world's greatest source of mineral wealth. Before the war it produced about 54 per cent of all the coal and 61 per cent of the iron. The United States in a slightly smaller area produced 38 per cent of the coal and 36 per cent of the iron. The war diminished Europe's production, but even now the value of all the minerals produced in Europe is probably nearly three times as great

as the production of all the rest of the world aside from the United States.

The coal of Europe, as we have seen, is practically all located along a relatively narrow and much broken strip extending from Ireland to southern Russia. About 95 per cent of Europe's supply, or about half the coal mined in the whole world, comes from the part of this strip from Poland westward. Since practically all the coal is mined in the progressive parts of Europe, the methods of extracting it vary little. The chief difference is that machinery is used more in Britain than on the Continent and more in the North Sea countries than farther east. But in this respect all parts of Europe are far behind the United States.

In the use of the coal the various parts of Europe differ more than in methods of extracting it. All countries use it for heat and power, but Germany uses it to an unusual degree as a raw material for manufacture. Britain, having much coal of high quality, has used it to build up her foreign commerce. Her exports are chiefly manufactured articles of small bulk, while her imports are food and raw materials of large bulk. If there were no other important articles of commerce, many British ships would have to make the outward voyage with very small cargoes, although they would come back fully loaded. But coal furnishes a bulky article which can be used to fill the outbound ships in place of the wheat and cotton carried by the inbound ships. This has been a great advantage in building up trade, although it has the disadvantage of depleting the future reserves of coal.

In Germany an opposite policy has been pursued. The German coal deposits are more limited than those of Britain; in proportion to the population Germany mines only about half as much as her rival. Moreover, the Germans have not needed to import food in any such quantities as the British. Germany has not exported her coal. On the other hand, the high development of chemistry in Germany has led to the extraction of by-products from coal before it is burned, especially aniline dyes. The stimulus thus given to chemical industries gave Germany an immense advantage in making poisonous gases and explosives during the war. Formerly the United States used coal only as fuel. Now, however, both this country and England are convinced that any country that has so extremely valuable a raw material ought to use it at home for dyes and chemicals.

The European iron ores are well distributed. They have been chiefly developed near the coal deposits in the active North Sea countries and especially in the district of Lorraine on the Franco-German border. Other deposits near the sea, however, in the northern parts of Sweden and Spain, are now largely mined for export to the coal of

Germany and especially England. Their relation to the coal is like that of the Lake Superior ores to the coal in Pennsylvania. In Europe, as in the United States, there is a growing tendency to load ships with ore in one direction and with coal in the other. Thus iron works have grown up on a large scale in Spain and Sweden, but since two tons of coal are needed to smelt one ton of ore, the main iron works remain near the coal. Sweden also uses the wood of her great forests to make charcoal with which some peculiarly good grades of tool-steel can be prepared.

Of the other mineral products which Europe produces in abundance, petroleum comes from the Caucasus region and Rumania; zinc from southern Germany with some from Spain and Italy; lead from Spain with some from Germany; platinum from the Urals, which formerly furnished over 90 per cent of the world's supply; potash from Germany and Alsace, which were almost the only sources until the war stimulated discoveries in the United States; pyrite from Spain; sulphur from Italy; and other materials in small amounts from other regions. Although the southern peninsulas, the Urals, the Caucasus, and the mountains on the borders of southern Germany are the only parts of Europe that are even moderately mineralized, the few resources are so well utilized that the continent produces more than 30 per cent of the world's coal, iron, lead, zinc, platinum, tungsten, potash, pyrite, sulphur, mercury, bauxite, graphite, magnesite, salt, stone, clay products, cement, and slate.

Two of Europe's most critical political problems center around coal. In the Saar Basin on the eastern border of France, the Versailles Treaty of 1919 gave France the right to the coal and provided that at the end of fifteen years the district was to decide by vote whether it wished to be part of France or of Germany, or to remain under the control of the League of Nations. In upper Silesia at the southeastern corner of Germany, a small tract containing coal was in dispute between Germany and Poland at the end of the war. A plebiscite showed that parts were prevailingly German, especially the industrial parts, while other parts, chiefly rural, were Polish. The League of Nations finally decided on a division, but neither in Silesia nor in the Saar region is either of the claimants thoroughly satisfied. Coal is so valuable that where there is any doubt as to what nation has the rightful claim, the situation may be serious.

How Manufacturing is Distributed in Europe.—The general distribution of manufacturing in Europe, Fig. 116, is much like that of health (Fig. 31) and general progress (Fig. 32), but it is also strongly influenced by the distribution of coal. Hence, the darkest shading in Fig. 116

xtends from Scotland through England, northern France and Belgium o southern and eastern Germany. It also includes Switzerland, for o some extent Swiss water power takes the place of coal. The rela- ively progressive agricultural countries of Norway, Sweden, Denmark, reland, southern France, Italy, Austria, and Poland fall in a group vhere manufacturing is moderately developed, while in the rest of Europe the amount is limited.

The types of manufacturing in Europe vary from the most complex o the most primitive. Where more than 30 per cent of the workers re engaged in manufacturing, the complex type predominates, highly aried raw materials are brought from a distance, and the completed roducts demand a relatively large amount of work and skill. In such egions the food of the cities is usually brought from a distance, either rom overseas as in Britain, Belgium, and western Germany, or from ther portions of the same country as in much of Germany and France.

In the regions where from 10 to 30 per cent of the workers are ngaged in manufacturing, the simple type prevails. The products nclude such articles as the butter and bacon of Denmark, the olive oil f Italy, the peanut oil of Marseilles, the wines of southern France, and ne linen thread of Ireland. Of course complex manufacturing is nore or less mixed with the simple type, but we are speaking of the kind nat is most abundant. Where the percentage of workers engaged in nanufacturing falls below 10, as in eastern Europe and some of the outhern parts, there is practically no complex industry whatever. small amount of simple manufacturing, such as the pig iron of southern Russia, the Urals, and Spain, and the wood pulp and lumber of Sweden, mixed with more or less of the primitive type such as the crude tanning f hides by nomads in southeastern Russia, the weaving of homespun oth in Bulgaria, and the spinning of woolen thread by the shepherds f Greece.

How Manufacturing Varies in the Regions where it is Most dvanced.—In studying each of the continents the distribution of anufacturing in general (Fig. 116) must not be confused with that of ecial industries. The general distribution depends first upon race, imate, stage of progress, and then upon coal and other sources of ower. The distribution of special industries within the general areas manufacturing depends on many factors including (1) the accident of ne original location of an industry, (2) raw materials, (3) transporta- on, (4) markets, (5) government policy, and (6) other conditions both eographic and economic. For example, in Britain the cotton industry located almost entirely in Lancashire west of the Pennine Range. his is partly because American cotton, which was long the only available

supply, enters England through Liverpool, and partly because the moist west winds on the windward side of the country provide the dampness which is needed to prevent the thread from roughening and hence breaking. The woolen centers, on the other hand, are located east of the Pennine Chain. Long ago when no wool was imported, one of the best and largest supplies came from the Pennine upland, and the shepherds found it easier to come down to Yorkshire than to Lancaster.

Shipbuilding in Britain centers at Glasgow on the Clyde, where iron, coal, skilled labor, and a protected harbor are all available. The making of steel goods, especially the bulky kinds such as rails, centers in places like Birmingham close to coal and not far from iron. On the other hand, the huge clothing industry is concentrated at London, because that city provides far the greatest market and the largest supply of cheap labor, and is the place where merchants from the rest of the country prefer to buy.

Other countries show the same localization of industries for similar reasons. The German iron and chemical industry centers on the western coal fields where such cities as Essen and Duisburg have grown up. Dresden specializes in pottery and art goods because she has good supplies of clay and has attracted workmen with artistic ability. Paris is the world's great center of highly finished ornamental goods, delicate dress fabrics, and other goods that appeal to the esthetic sense. There seems to be no physical reason for this. It apparently arose from the artistic character of the early Parisians and the fact that formerly the presence of rich monarchs drew skillful workers to the city, while now the fame of Paris attracts people of artistic temperament. Every art student who goes to Paris helps to strengthen the city's position as a center of good taste. The industrial history of Paris well illustrates the fact that when an industry is thoroughly established it tends to perpetuate itself in the same place, especially if it requires high skill. The same condition is evident on a smaller scale in the silk manufactures of Lyons, and the watches, laces, and other fine goods of Switzerland.

How Manufacturing Influences European Progress.—The growth of manufacturing has a profound influence upon the distribution of many factors that influence human progress. (1) The most obvious effect is to cause great density of population, as appears from a comparison of the European parts of Figs. 1 and 116. If the data on which the manufacturing map is constructed were as full as those for the map of density of population, the resemblance would be still greater. The distribution of population, however, is by no means entirely due to manufacturing. In 1700, when all manufacturing was largely primitive, the

neral distribution of the relatively sparse population was much the me as to-day, but there was no such density as now.

(2) What manufacturing chiefly does is to foster the rapid develop- ent of large cities. How true this is may be judged from Table 5, nich shows the percentage of the European population living in cities over 50,000 people. In England, about 56 per cent of the inhabitants e in such cities, in Yugoslavia where there is little manufacturing, ly 4.

(3) Where such concentration occurs, people's chances to get an ucation, and to study art, literature, music, and science are much creased. In the large manufacturing cities of western Europe the abitious workman can get almost any kind of training. Free schools, cial settlements, public museums, and many lectures, concerts, and stitutions of higher learning are open to him. Vocational training a modern innovation whose distribution depends largely on manu- cturing, for modern industry demands a great amount of technical ll and the concentration of population brings together large groups o need the same training. In England vocational education is ected especially toward mechanical and engineering problems; in rmany, where it is highly developed, the chemical industries receive cial emphasis.

(4) Another condition whose distribution is greatly influenced by nufacturing is the opportunity to rise from one social grade to other. In the rural districts of Europe the son of humble parents is pected to be more or less like his parents. In the great business enter- ses of the cities each man or woman is rated more nearly according his own achievements and character, and is advanced accordingly. us manufacturing, together with the commerce which accompanies it, s been one of the strongest factors in breaking down the old class tinctions all over western Europe and especially in England.

The Bad Effects of Concentration in Industrial Cities.—The bad cts, like the good effects of manufacturing, are very evident in tain, Belgium, and Germany; less conspicuous in France, Italy, nmark, and Sweden; and scarcely noticeable in Bulgaria and eastern ssia.

(1) One bad effect is the high death rate of cities. Other things ng equal, the great congested cities with their huge buildings and all space for living kill people off much faster than the rural or urban districts where there is plenty of pure air, sunlight, space, ss, and trees. Only through enormous expenditures for pure water, itation, hospitals, medical service, and vacations, can the urban th rate be kept down.

(2) The growth and congestion of cities under the influence of manufacturing cause them to become centers of evil as well as of opportunity. Almost nowhere else are the slums so terrible, the poverty so dire, as in the great manufacturing cities. London's slums are among the worst places on earth. The cities of eastern Russia and Greece rarely see either wealth or poverty, squalor or splendor, misery or success like those of London, Liverpool, Glasgow, Paris, Berlin, and many other manufacturing cities. Fig. 116 showing the distribution of manufacturing might almost be labeled "Distribution of Extremes of Poverty and Wealth." This tendency has been greatly increased in recent decades by automatic machinery which is not only labor-*saving* but labor-*stupefying*. A machine that can perform scores of operations with almost human skill is indeed a great triumph of human invention. But to sit for hours before such a machine doing nothing except tie threads, for example, or shove in bits of metal, is so monotonous that it often drives people to seek harmful excitement and pleasure or else makes them hopelessly dull. Shorter hours and opportunities for recreation have become common in western Europe largely on this account, but factory work still tends to deaden the abilities of millions of people in the great cities. A few, of course, who do the more interesting and skillful work, are benefited, but the stimulus which comes to them by no means balances the harm that comes to the others.

(3) Such conditions give the manufacturing communities of western Europe a series of problems wholly different from those of the commercial and agricultural sections. Strikes, labor reforms, the movement for short hours, plans for community recreation and instruction, and the movement to induce city workers to move into the suburbs and have their own homes and gardens are only a few of the many activities that center in the great industrial cities. Such movements are most active in the great British cities, but are also prominent in the Continental manufacturing cities. Sometimes they take special forms such as the old age pensions of Germany. Outside the areas of intensive manufacturing, however, they diminish greatly in importance. A map of manufacturing in Europe is almost a map of movements for social betterment.

(4) Another dangerous condition, which is due to many causes but which is most noteworthy in the manufacturing regions, is the decline in the size of the families of the more competent parts of the community. The scarcity of children in France and Ireland, to be sure, indicates the great importance of other causes beside modern industry and its accompanying high standards of living and love of extravagance. On the whole, however, the area of few children extends from Scotland to

witzerland with a bulge eastward in Germany just as does the area of ntensive manufacturing. Of course small families are not in themelves a danger, especially if they prevent a country from lowering its tandards of living. The danger lies in the fact that the competent amilies and the competent nations have few children, while the incometent have many. Hence in the next generation, when the growing omplexity of civilization will demand more people of high ability han ever before, there may be less than ever in proportion to the total opulation.

How this applies to the countries of Europe is shown in the excess f births over deaths. In France, even before the Great War, the births ach year among every 1000 people exceeded the deaths by only 0.9. ince the births are more numerous among the incompetent classes han among the people with thrift and ability, France was actually osing in its percentage of competent people. In the other manufacturing ortions of western Europe and also in Spain and Ireland, the excess f births over deaths was less than 12 per thousand inhabitants. Even the competent people were not diminishing in number, they were ot increasing as rapidly as the rest of the population. Only in the Tetherlands, the great commercial country of western Europe, was here an excess of births (15.2) comparable to that of the less progressive egions of Portugal (14.1), the Balkans (14.5 to 18.6), and Russia (16.7). n other words, the tendency before the Great War, and also now wherver things have gone back nearly to normal, is not only for the weakest lements in each nation to increase most rapidly, but for the weakest ations to increase much more rapidly than those that are more cometent. If the tendencies shown before the war should persist for a hunred years, the descendants of 1000 people would number only 1094 n France, compared with about 6200 in Bulgaria. In a hundred years, the recent rate of increase should continue, which is not probable, umania would have about 45 million inhabitants, or more than rance would then have, while Russia would have nearly 500 million, r more than all Europe at present.

Because of the rapid increase of population in northern, southern nd especially eastern Europe previous to the war, the backward nations ere gradually invading and displacing those that are more advanced. or example, Asiatics were gradually pressing into Russia; Russians ere moving westward; Germany was being invaded by Poles; while ermans moved westward into France, Britain, and across the seas. n 1913 there lived in Germany 919,000 Europeans from countries anding lower than Germany in the scale of civilization as described an earlier chapter, and 317,000 from countries standing as high or

higher. The same displacement of people with high standards of living by those with low standards has been taking place in all manufacturing countries—in the United States most of all. Formerly, when people supposed that mere numbers were an index of strength, this condition was regarded as an advantage. Now that the importance of quality rather than quantity is realized, Germany, France, and Great Britain, like the United States, are wondering what they ought to do to insure a strong mental as well as physical inheritance to future generations.

Transportation in Europe.—The geographical distribution of facilities for transportation in Europe is much like that of other activities. The facilities are best near the North Sea, and decline more or less regularly in all directions. The conditions that lead to a well-developed transportation system include; (1) an active, intelligent, and prosperous population, (2) gentle relief, (3) an extensive and well indented-seacoast, and (4) an abundance of inland waterways. Such a system comprises: (*a*) roads for local traffic, (*b*) trolley and tram lines for urban and suburban intercourse and especially for people going to work, (*c*) railways for fast traffic over long distances, (*d*) inland waterways for slow, cheap, heavy traffic, and (*e*) harbors and ships for traffic with other countries.

Among the countries of the world few or none surpass the Netherlands in conditions that favor transportation, or have a finer transportation system or a greater commerce in proportion to the population. Its 2380 miles of railway give the Netherlands a larger mileage in proportion to its area (192 miles per 1000 square miles of area) than that of any country in the world except England (282), Belgium (255), and Switzerland (228), although parts of countries, for example Massachusetts, surpass it. In addition, the Netherlands has a nearly equal length of canals (2000 miles), and of light railways (1700 miles) corresponding to our trolley lines, and about 1150 miles of river waterways on the Rhine, Maas, Scheldt, and their tributaries. In addition it has a fine system of highways including about 3000 miles of state road. How it compares with other countries may be judged from the table on page 451.

In total mileage of transportation lines in proportion to the respective areas, the Netherlands is surpassed by Massachusetts and very slightly by Belgium. In proportion to the population the Netherlands is well ahead of Belgium, while the fact that waterways usually furnish a better means of communication than landways would put it practically on a par with Massachusetts which leads the United States in facilities for transportation, were it not for the far greater abundance of motor vehicles in the United States than in Europe.

LENGTH OF LINES OF TRANSPORTATION PER 1000 SQUARE MILES OF AREA

Form of Transportation	Netherlands	Belgium	England	Germany	Scotland	Ireland	Bulgaria	Massachusetts
Railways	192	255	282	182	130	105	34	265
Light railways	137	220	38	47	10	5	0	397
Inland waterways	250	109	63	41	6	26	7	2
Total	579	584	383	270	146	136	41	664

LENGTH OF LINES OF TRANSPORTATION PER 10,000 POPULATION

Form of Transportation	Netherlands	Belgium	England	Germany	Scotland	Ireland	Bulgaria	Massachusetts
Railways	3.9	3.8	4.6	5.6	8.2	7.8	3.1	5.8
Light railways	2.8	3.3	6.1	1.5	0.6	0.4	0.0	8.7
Inland waterways	5.1	1.6	1.0	1.3	0.4	1.8	0.6	0.1
Total	11.8	8.7	11.7	8.4	9.2	10.0	3.7	14.6

The first and more important part of the preceding table illustrates the decline in transportation as one proceeds away from the Netherlands and Belgium. Toward the northwest, although England excels even Massachusetts in ordinary railways, it falls far behind the Low Countries in light street railways and in waterways. Scotland and Ireland both fall much lower. It should be noted, however, that in proportion to the population the transportation systems of the Nethlands and England are practically equal, while those of Ireland and Scotland both rank high. Toward the east (in Germany) all kinds of transportation fall behind Belgium and the Netherlands, although this is true chiefly of the eastern portions and not of the west where conditions resemble those in the Low Countries. Farther east in Bulgaria, the railroads become of slight importance, there are practically no light railways, and the Danube is the only important waterway aside from the Black Sea.

In other directions a similar decline in transportation is manifest as one proceeds away from the Netherlands. In spite of local differences, waterways rapidly cease to be of importance, light railways such as our trolley lines almost disappear, while railways become scanty, although

the change in them is not so rapid. The diminution in these types of transportation is accompanied by a decline in the character of the roads; and wagons take the place of motor vehicles. In large parts of such countries as southern Spain, Sicily, Albania, and southeastern Russia, the roads degenerate into mere trails, and both freight and passengers are often carried on the backs of horses and asses. Northward the same transition is apparent, for in northern Norway carts give place to pack animals, and the Lapps carry their goods over faint trails upon the backs of reindeer, or in sledges over the snow.

The Distribution of Trade and Commerce.—Our discussion of other types of activity, especially transportation, has already indicated how European trade and commerce are distributed. Unfortunately statistics as to domestic trade are not available, while those for foreign commerce, as was pointed out in Chapter XII, create a wrong impression because small countries show a greater per capita trade than large countries of equal activity. Nevertheless, it is worth while to study Fig. 64 showing the per capita foreign commerce of different parts of Europe. In a general way it resembles the maps of transportation, manufacturing, and health. It is difficult to say whether commerce causes the development of transportation facilities, or whether the facilities cause commerce. When active people wish to carry on commerce, they improve the transportation facilities, and take advantage of easily traversed plains, low passes in the mountains, and rivers that can be made navigable. But as soon as a road, a railway, a canal, or a harbor is built or improved, it at once stimulates commerce and thus creates a demand for still better means of transportation. In the last analysis both transportation systems and commerce are results of human activity. In Switzerland, for example, the construction of railways is more difficult than in almost any other country of Europe, but Switzerland has more railways per square mile than any other countries except England and Belgium, and four of its tunnels through the Alps are among the masterpieces of engineering. The reason is that the Swiss are highly capable and their rough country lies between the active people of France, Germany, and the North Sea regions on the one side, and the active people of North Italy and the whole rich Mediterranean region on the other side. Hence railway construction has been about a hundred times as active both in proportion to the area and to the population as in the level and easily traversed plains of southeastern and northeastern Russia.

Another illustration of the way in which the people count for more than the natural resources is shown in the value of Russia's pre-war trade with a million people in each of the other countries of Europe.

Germany and Austria have a large Russian trade because they are Russia's near neighbors. But Rumania, Bulgaria, Greece, and old Turkey stand low even though they are near neighbors and are reached by easy ocean transport. They are much exceeded not only by Denmark, England, Belgium, and the Netherlands, which have easy oceanic connection with Russia, but also by landlocked Switzerland. This means that the impulse toward trade comes largely from the active countries. They want the wheat, flax, manganese, petroleum, wood, and other products which Russia can furnish. They also want to sell their cloth, knives, machines, and manufactured ornaments. Hence they start trade and keep it up, by educating the less active people to want the goods that are brought them and to produce the things that the manufacturers want. If this great principle is grasped it helps to explain the commerce of any two countries no matter where they may be located. The exact details of the articles that pass between the two can be remembered only by the specialist, but the general nature of the commerce can be known by everyone.

EXERCISES AND PROBLEMS

1. How far do statistics bear out the statements of the text in regard to the changes in agriculture as one travels from the Franco-Belgian center? Answer this by making tables of the following form based on Tables 12 and 14.

AVERAGE PRODUCTION PER ACRE

Country	Wheat	Potatoes	Corn	Barley	Oats	Tobacco

2. Compare the distribution of agriculture and of cities in Europe. Prepare isopleth maps based on Tables 7 and 5. Explain the resemblances and differences.

3. Study the countries used in Exercise 1 and determine whether the countries which stand low in agriculture stand high in manufacturing and mining. Tabulate the countries according to their rank in (*A*) the chief minerals, Table 25; (*B*) the number of cotton spindles, Table 30. On what factors does the distribution of mining depend? What correlation is there, if any, between the distribution of cotton manufacturing and any special geographic factors?

4. From Table 38 using the columns of Imports per capita and Exports per capita again study the countries of Exercise 1 and arrange them in order of importance in regard to commerce. Is the order in this case related in any way to the previous tabulations? Compare carefully and account for any discrepancy.

5. Select some product (vegetable, animal, or mineral) and study its occurrence in the various parts of Europe. Begin as usual by preparing tables and maps on the basis of all the information you can get in this book and elsewhere. Then read up on the product, and finally write an account of its distribution, its variations from place to place, the extent to which its production varies because of varying geo-

graphical and human conditions, and the degree to which it influences man's activities. Give causes wherever possible.

6. Make a careful study of one of the following European subjects: (*A*) the distribution of manufacturing; (*B*) the transportation system; (*C*) foreign commerce; (*D*) colonial possessions; (*E*) finances. Let your study center around the problem of *distribution* and of the reasons for the differences between one part of the continent and another. Begin by preparing tables and maps from the data in this book and from *The Statesman's Yearbook*. Use other reference books, but base your work primarily on statistics and maps. The method used in Exercise 1 will help you.

7. Make an intensive study of business conditions in some European country. (*A*) Prepare a table showing its conditions compared with those in the United States, on the basis of Tables 1, 4, 7, 9, 11, 12, 13, 14, 15, 25, 30, 35, 36, 38 to 40, and 42 to 44. If your country fails to appear in any of these tables ascertain its approximate condition and the probable reason for its omission. (*B*) Get as much information as possible from *The Statesman's Yearbook*, the encyclopedia, geographical textbooks, and other sources, and prepare other tables, especially on manufacturing, transportation, and commerce. (*C*) Write a report setting forth the most important facts which ought to be known by a business man who expects to have dealings with your country. Illustrate it with tables, diagrams, and maps. (*D*) Present the gist of your report to the class in a five-minute talk.

8. Prepare a report on some special activity or type of business in Europe such as textile manufactures, iron and steel products, use of motor transportation, canals, and coastwise traffic, lumber supply, potato culture, stock raising, aluminum production, relative financial strength of countries, their artistic preferences. Hundreds of such topics are treated in newspapers, magazines, and books. In each case try to determine the relative importance of your topic compared with others. Illustrate your report with maps. Give statistics if possible. Where none are available give approximate data, but carefully distinguish between these and exact data such as appear in the tables of this book. In all cases compare Europe with the U. S. and compare individual countries with your own state. Remember that your work will not be fully successful unless you show how your special topic is related to the various factors of geographic environment.

9. Study the relative capacity of European countries as indicated by psychological tests of foreign-born recruits in the United States Army during the Great War. The percentages of foreign-born recruits in the three higher mental grades (*A*, very superior; *B*, superior; and *C*, average) were as follows:

1. England... 91.3	7. Belgium.... 76.2	11. Turkey (Armenians, etc.).. 58.0
2. Holland... 90.2	8. Norway.... 74.4	12. Greece..... 56.4
3. Denmark.. 86.6	9. Old Austria-	13. Russia..... 39.6
4. Scotland... 86.4	Hungary.. 62.5	14. Italy..... 36.6
5. Germany.. 85.0	10. Ireland..... 60.6	15. Poland..... 30.1
6. Sweden.... 80.6		

From these figures construct a shaded map of Europe with isopleths at 80, 60, and 40. How far does your map resemble the maps in Chapter XVII? What inferences do you draw from this as to the conditions of business? To what extent does this exercise help you to determine how much of the relative progress of different parts of Europe is due to race, how much to geographic environment, and how much to education, government, religion, and so forth?

CHAPTER XXX

ASIA: THE CONTINENT OF DIVERSITY

The Interplay between Asia and Europe.—Since the dawn of history the people of Asia have again and again overwhelmed Europe, while the Europeans have pressed back into Asia. The broad-headed Alpine and other people of central and eastern Europe—the Slavs, Huns, Magyars, and Turks—are derived from Asia's later overflow. The conquests of Alexander, the Asiatic expansion of Rome, the Crusades, and the present domination of large parts of Asia by Europeans represent the reverse movement from Europe. Each outward migration from Asia has permanently influenced the trend of civilization in Europe; but in Asia the European conquerors have disappeared or been absorbed without producing any marked effect. To-day the interplay between the outward tendency of Asiatic migrants and the tendency of Europeans to dominate Asia but not settle there, is one of the main factors in the world's political and business relations. Chinese and Japanese migration to America, a "white" Australia, Hindu coolie labor in South Africa and South America, and colonial troops in the Great War are all phases of this problem. So, too, are Asiatic colonies and mandates, the control of raw materials and food supplies, the "open door" policy in the Far East, and the building of railways in China, Siberia, India, and elsewhere.

Asia's Disadvantages in Size, Shape, and Position.—The contrasted tendencies of Asia and Europe depend largely on their geography.

(1) Asia's great size and peculiar topography make the interior very dry, and permit great extremes of temperature. This causes widespread barrenness and migration. The size also fosters isolation and backwardness because communication by land is more difficult than by water. Scarcely 5 per cent of Europe is more than 600 miles from the sea, compared with about 35 per cent of Asia, or one and one-half times the area of Europe.

(2) The *shape* of Asia is also a disadvantage. Europe and Asia have an interesting resemblance like that of the right and left hands. Thus (*a*) Asia Minor corresponds roughly to the upper Balkan peninsula ending in Constantinople; (*b*) Arabia corresponds to Greece; (*c*)

India to Italy; (*d*) the Malay and Indo-Chinese peninsula to that of Spain and Portugal; (*e*) Chosen to Brittany; (*f*) Japan to Britain; (*g*) the Japanese Sea to the North Sea; (*h*) the Sea of Okhotsk to the Baltic; and (*i*) the Kamchatkan peninsula to Scandinavia. But the Asiatic gulfs and seas penetrate inland far less than those of Europe. Moreover, the most important coast faces east in Asia and west in Europe, so that the prevailing westerlies of the most favorable latitudes do not appreciably modify the severity of the Asiatic climate. Another reason for the contrast between the continents is that Europe is a peninsula of Asia. When the severe climate of inner Asia or any other of the many possible causes drives people outward, they migrate into the peninsulas. Hence, Europe has a great mixture of races. The various branches of the Nordics, Mediterraneans, and Alpines owe much of their present distribution to pressure from Asia. The repeated droughts in inner Asia, the scarcity of food, and the increase of population seem to have been among the reasons for the barbarian migrations of earlier times.

(3) Again Asia's position is not so good as that of Europe. About two-fifths of Asia lie in the unfavorable latitudes north of 60° or south of 30°, while only about a fourth of Europe lies north of 60° and none south of 30°. Moreover, although the island groups of Britain and Japan both face America, Japan is over twice as far from America as is Britain, and faces the portion where the rugged relief, the relatively dry climate, and the newness of the country restrict the population.

The Great Disadvantages of Asia's Relief.—In relief Asia is at a great disadvantage compared with Europe. This is primarily due to the vast central mountain system, comprising Asia Minor, the Caucasus, Elburz and Hindu Kush mountains, and the great mass of highlands bordered by the Himalayas and the Burmese ranges on the south and the Tian Shan, Altai, and Stanovoi ranges on the north. On a good relief map notice how the mountains of both Europe and Asia form loops enclosing plains, plateaus, or basins. In Europe the loops of the Po, Hungary, and Rumania, swing around low areas with easy access to the sea or to other plains. Only in the far west does Spain contain an elevated plateau practically surrounded by mountains. In Asia all the loops are of the unfavorable Spanish type, and are of vast size, comprising about 6 million square miles. Asia Minor, for example, is a high, sparsely populated, mountain-girt plateau accessible from the sea only by way of steep, narrow valleys. Farther east the mountains contract into the knot of the Armenian Highland where Ararat rises 17,000 feet. Then comes another and greater loop, the elevated basin or plateau of Iran where a million square miles in Persia, Afghanis-

tan, and Baluchistan are almost completely cut off from the ocean, and can support only ten or twenty people per square mile. Next, in the mighty knot of the Pamirs north of India, great mountains rise from a huge plateau ten to fifteen thousand feet above the sea. Farther east one series of mountain chains extends from the Pamirs to Behring Strait, another stretches from the Pamirs to the northern tip of Siam, while a third running from northern Siam to the Sea of Okhotsk lies from 200 to 700 miles from the Pacific coast. These three sets of mountains enclose an area larger than Europe and almost completely cut off from the ocean. So dry, high, or inaccessible is it that Tibet, Chinese Turkestan, Mongolia, and Trans-Baikalian Siberia contain little more than one inhabitant for each of the 4 million square miles. Yet these regions occupy the best latitudes, 30°–50° N., and correspond to the United States from the Appalachians westward to the Rockies.

The vast mountain mass extending from Asia Minor to the Pacific also harms Asia by almost completely separating the north from the south. Mountainous projections in Persia and Indo-China divide the southern section into three isolated regions centering in Mesopotamia, the Indo-Gangetic plain, and the plains of China. To-day no railroad crosses the mountains from north to south, or penetrates from one of the three southern regions to the other. The only place where a railroad can easily cross from north to south is eastern Persia and western Afghanistan. This route, where railroads from India and Asiatic Russia now almost meet, corresponds quite closely with the gap in the European mountains along the Rhone Valley. But in Asia nearly two thousand miles of desert separate the productive regions of the Caucasus and the Indus delta, while the European railway everywhere runs through a land of dense population and wonderful possibilities. Great cities like Lyons and Marseilles in Europe correspond to little mud towns like Merv and Herat in Asia.

Railway connection between the east and the west of Asia is almost as limited as between the north and south. Only in the far northeast does the Siberian railway cross the northern wing of the great central mountains. There, too, vast barren tracts must be traversed. For a thousand miles between the fairly prosperous Irkutsk region and the fertile part of Manchuria, the Trans-Baikal region is so cold that there is almost no population. Chita, with its 80,000 people and its log huts, occupies a position on this line comparable to that of stately Vienna which guards the passage of the mountains on a similar line in Europe.

The plains of Asia, although of vast size, are for the most part much less desirable than those of Europe. In the huge Siberian plain the

Ob, Yenesei, and Lena river systems would provide fine inland waterways, were it not that their northward direction largely destroys their value, while the low temperature greatly restricts the population. The southern plains in Arabia and India are much handicapped by being either too dry or too warm.

The other main features of the relief of Asia are the plains of the eastern coast from Manchuria to Indo-China, and the mountainous island fringe from Sakhalin and Japan to Sumatra and Ceylon. The plains, though fertile, are small compared with those of Europe, the United States and South America, and the islands are extremely rugged. In general the relief of Asia hampers human progress because it divides the continent into a number of diverse sections instead of drawing a large part toward a center as in Europe, and because the most favorable relief is located where the climate is unfavorable.

The Great Climatic Extremes of Asia.—The size, shape, position, and relief of Asia all combine to produce climatic extremes and contrasts. Fully half of the continent has a winter climate colder than that of anything except the northern fringe of the inhabited parts of North America. This is a serious deterrent not only to agriculture, but to human health and efficiency. The summers, however, even in this northern half are warm. Near the Arctic Circle the maximum temperature is sometimes 85° F. In Yakutsk, in latitude 62° N., the July average is 66° F., or as high as on the northwestern coast of Spain, 20° farther south. The period of active plant growth, however, lasts only three months instead of eight. Farther south, the summer temperature is usually extreme. At Tashkend, for example, in the latitude of New York, it averages over 80° in July, and remains above 74° for three months. Aside from limited areas at high levels in relatively low latitudes, almost all parts of Asia suffer at some season from prolonged and harmful extremes of cold or heat.

Northern Asia gets some rain from local showers in summer and some from cyclonic storms. North of latitude 52°, the coolness of the summers causes a small rainfall to suffice for forests and agriculture. Asia, however, has relatively few cyclonic storms like those of the United States and Europe. In fact, Japan is the only Asiatic region that can compare with Europe in number of storms and hence in the stimulating quality of its changes of temperature, humidity, and sunshine. In the latitudes which in Europe are most favorable, that is, from about 45° to 52°, the summers are so warm and dry that the region east of the Ural river and north of the Sea of Aral and Lake Balkash forms a steppe or grassland, good for horses, sheep, and camels, but generally too dry for crops.

Farther south a vast desert belt, 50 per cent larger than Europe, extends from Aden in Arabia and Aleppo in Syria almost to Peking in China and Harbin in Manchuria. Certain areas like Russian Turkestan have well-watered and fertile valleys that support a fairly dense population, but they form a small percentage of the whole. This desert belt, extending across Asia from the Red Sea almost to the Pacific Ocean, intensifies the effect of the mountains in separating northern and southern Asia. It limits the natural resources by discouraging vegetation; moreover, the extreme dryness, the monotony from day to day, and the enforced nomadic life of many of the people retard the development of even the scanty resources that are available. The distress and wars arising from periodic dryness within this belt are generally supposed to be among the chief reasons why the people of central Asia have migrated outward so often.

On the western margin of the Asiatic deserts, Syria, Asia Minor, Armenia, and northwestern Persia belong to the same subtropical or Mediterranean climatic province as Sicily and Greece. Fairly abundant rain in winter, but almost none for five or six months in summer gives them the disadvantages of one-crop agriculture, a relatively sparse population, and dependence in large measure on animals. Here, more than in almost any other part of the world, innumerable dry ruins appear to indicate that one of the prolonged climatic pulsations to which the earth is subject is now causing this particular region to have fewer storms, less rainfall, a less stimulating climate, and more malaria and other diseases than two or three thousand years ago.

South and east of the Asiatic deserts the rainfall of India, Indo-China, China, and Manchuria displays a marked contrast to that of the southwestern countries. The dry winters and wet summers of the south and east are the reverse of the dry summers and wet winters of the southwest. The dry southeastern winters are due to monsoon winds blowing out from the area of high pressure in the Asiatic interior; the wet summers to inblowing monsoon winds caused by low pressure in the interior. The summer winds come from relatively warm seas and are forced to rise over high mountains. The rainfall which they bring is one of the chief causes of the dense population and remarkable development of agriculture in southeastern Asia.

Business Relations of Northern Asia.—The climate of Asia and the relief and other geographical conditions have a profound effect on the character of the people and on their relation to the world's business. In the north beyond the Arctic Circle, the cold Tundra belt with its scanty vegetation is so devoid of natural resources and of inhabitants that it is commercially and industrially negligible. Next comes the

great forest belt of Siberia, lying chiefly between latitudes 55° and 65°, but descending to latitude 50° near Lake Baikal and 40° near Vladivostok. This is sometimes spoken of as the world's greatest timber reserve outside the torrid zone. In area it is indeed the greatest, but not in quality or in capacity to furnish a steady supply. The trouble is the climate. The extremely long, cold winters, and in some places the light rainfall cause many of the trees, which are chiefly conifers, to be relatively small and stunted. The *taiga*, as the low swampy forests are called, makes good paper pulp but not good merchantable timber. Moreover, the trees do not grow especially fast, so that their speed of replacement is only a fraction of that in regions like western Oregon where the conifers live under almost optimum conditions. Doubtless many lumbering communities will some day be scattered through the Siberian forest, but they are likely to be crude and migratory. In the highlands of eastern Siberia gold is abundant and other metals may give rise to mining towns. But these are scarcely better than lumber camps as promoters of civilization.

Why the Agricultural Belt of Siberia has Little Trade with America.—On the southwest the forests merge into the Siberian agricultural belt which is traversed by the Siberian railway. This belt has been the basis of rosy but doubtful prophecies that Siberia is the white man's land of the future; that it will some day rival the United States. The plain with its deep, fertile soil, is climatically one of the best parts of Asia and is fairly well adapted to the white man. It produces a moderate abundance of wheat, oats, barley, and hemp, and of horses, cattle, sheep, and swine. It also has a supply of fairly good coal west of Lake Baikal. But these advantages are largely offset by certain disadvantages. First, the belt is more limited than is generally supposed. It has a width of scarcely 500 miles and extends eastward from the Urals only about 2000 miles; that is, its total area is about a million square miles or a third of that of the United States. Northward and also eastward in the plateaus beyond Lake Baikal the climate is too cold for profitable and extensive agriculture, while southward it is too dry. Even in the belt itself the agricultural possibilities are limited by the cold.

In the second place, the facilities for transportation are poor. The plain and the rivers indeed appear favorable, but the rivers are frozen about half the year and empty into the Arctic Ocean. The plain is often only half covered with snow in winter so that neither runners nor wheels can be used, and it is hopelessly muddy in spring when the snow melts. Worse than this is the great distance to markets. The agricultural belt of Siberia is adapted to only a few food products; the nearest large manufacturing region which needs abundant food from

a distance is Germany, over 2000 miles from the central part of the Siberian wheat region near Tomsk, Omsk, and Barnaul. For that reason the more progressive Siberians have taken to raising dairy products, for butter and cheese can stand long transportation because of their high value in proportion to their bulk.

Unfortunately, the people of Siberia are not particularly alert. The explorer, Nansen, like many others, speaks again and again of the apathy of the Siberians, their tendency to sit still and do nothing. Russian exiles in the days of the Czars repeatedly went to Siberia full of plans for study, self-improvement, and writing, but almost invariably, especially in the east where the climate is most severe, they gradually fell into apathy. Doubtless this was due partly to the isolation, but the long, severe winters when the tight houses are as hot and dry as deserts, and when there is nothing to do out of doors, probably have much to do with it. At such times the exertion required to keep warm out of doors creates a reaction which produces lethargy indoors. Moreover, for many months there is almost no work that people can do. They sit in the house and acquire the habit of idleness. Even in the south at Semipalatinsk, seven months are colder than the coolest month in London, while at Tomsk, April is colder than January in New York. One result of all these conditions is that, from the standpoint of American commerce, Siberia is a very small factor. Neverthless, the minerals, furs, lumber, and fish of the eastern portions ought not to be overlooked by Americans in their search for raw materials and food.

The Development of the Desert.—Irrigation may add a few million people to the inhabitants of the Asiatic deserts, but the products thus raised in the heart of Asia are not likely to be much importance to a region so far away as America. On the other hand, the enormous dry area from western Manchuria and eastern Tibet to the Black, Mediterranean, and Red seas may prove to be a storehouse of unexploited minerals. On its borders near the Hwang River in Shensi lie the great Chinese coal fields; farther west the mountains of Tibet and Turkestan contain much gold; in the Tarim basin salt deposits give promise of supplies of potash; in Persia copper has been reported again and again; in Mesopotamia and Persia lie some of the most promising oil fields; while many other places suggest great possibilities although little is yet known with accuracy. In the future, metallic ores and fuels are almost certain to be relatively more valuable than now. Thus, though the deserts of Asia now seem of little value, the time may be near when they will be highly prized. The nations of Europe and Japan are keenly interested in mineral rights and railway concessions

in these regions. Even the far away United States has taken a hand by declaring the "open door" policy which insists that all nations shall have equal opportunities in China and the neighboring regions, and by insisting that Americans shall not be barred from developing oil in Persia, Mesopotamia, and other regions where Europe is encroaching. To-day the United States is more and more advancing capital, and supplying engineers, managers, and machinery, and some day may draw on these regions for important supplies, just as it formerly drew on Russia for platinum. These considerations mean that for inner Asia, as for the Far East the United States wants the open door policy, and some international control which will insure good government, protect and develop the native people, and give all countries a fair and equal chance without robbing the natives.

One of the drawbacks to the future development of the Asiatic deserts is the character of the people. Deserts, like every other type of physical environment, exert a selective action so that certain kinds of people tend to die out while other types are preserved. The nomadic life, which usually prevails in Asia where the climate is too dry for agriculture and where animals are the chief source of livelihood, gives little or no advantage to people who are steadily industrious, or who have commercial or mechanical ability. Among the men in such tribes the thing that counts is the ability to brave danger, fight wild beasts, herd the sheep to safety in a storm, follow straying horses or camels all day and all night, or make a fierce sudden raid for plunder or vengeance. In every case, swift and relatively short activity is required. When that is over, the nomad lies down in his tent and rests. For days he may do little except spend an hour or two on horseback to see that the animals are safe and sound. The women milk the sheep, prepare the sour milk and cheese, pack up the tents for a migration, and knot the rugs or beat the felts which are the main articles of furniture and adornment. But even their work is less arduous than that of equally primitive sedentary women who hoe the crops and grind the grain by rubbing one stone upon another. In the same way commercial ability is of little value to the nomad. A good trader and industrious worker who did not have the courage to ford a rushing stream in the dark and the energy to get up at night to fight the wolves would make a poor nomad, and his children would probably be poorly fed. His type would gradually die out. Thus the unbusinesslike character of the desert people and their frequent lack of steady industry impose important difficulties in developing regions like Mongolia. Nevertheless, many of these people have admirable qualities, while the oasis dwellers of Turkestan and Persia have a great deal of industry although they lack initiative and energy.

The great obstacle to the development of the mineral wealth of the Asiatic deserts, provided it exists, is not so much the people as the remoteness and lack of transportation facilities.

The Contributions of Southwestern Asia to the World's Business.—Southwestern Asia interests America deeply because Mesopotamia, Syria, and Palestine were once the home of great civilizations which gave us not only religion, but the beginnings of science and art. More recently American philanthropic efforts have been especially active in this general area of the Near East. Moreover, Americans are much interested in Britain's restoration of the great irrigation system of Mesopotamia, in the French attempts to build up Syria, and in the Zionists' plans for restoring the prestige of ancient Palestine.

The usual enumeration of the commercial relationships of Turkey, Persia, Syria, and Palestine includes the facts that those countries buy cloth, sewing machines, and other manufactured articles from the United States, and that we buy from them beautiful rugs, dates, Smyrna figs, Turkish tobacco, hides, wool, and the like. This list sounds imposing, but the total trade of all these regions with the United States amounts to only twelve or fifteen million dollars, or scarcely a third as much as our trade with New Zealand. New governmental conditions are indeed opening avenues of trade that were formerly closed, but the relation of America to the Near East through education, missions, philanthropy, and the journeys of sight-seers to Constantinople and especially Palestine have more effect on American life than have our direct commercial dealings.

A still greater effect of the Near East is the fact that it has contributed to the United States as well as to the rest of the world certain racial stocks, such as the Syrians, Armenians, and especially the Jews, whose influence upon business has been extremely great in proportion to their numbers. The Jews and Armenians are generally recognized as having unusually clear-cut racial characteristics. These include great business capacity; unusual perseverance and tenacity; great thrift and economy; a tendency to avoid politics, military occupations, and the walks of life that make them conspicuous as leaders and rulers; and a tendency to excel in less conspicuous but no less influential lines including not only business, but science. Of course, few Jews have all these qualities; and some depart from them widely. Nevertheless, they represent fairly well some of the main characteristics of a race which has produced an extraordinary succession of unusually able men. Perhaps no race to-day in proportion to its numbers has a greater influence upon business all over the world; none has had so profound an

influence upon religion and thus upon moral standards; and perhaps none has proportionately contributed more to the world's scientific progress.

The origin of the racial traits of the Jews, as of every other race, is still beyond our knowledge. Certain environmental influences, however, have tended to preserve those members of the race who were most strongly imbued with the qualities mentioned above. While Palestine is generally spoken of as the home of the Hebrews, as the early Jews were called, most of that country was inhabited by them for only a short time. The ancestors of the modern Jews came from the rough little plateau of Judea, a tiny tableland about 45 miles north and south by 15 east and west. It stands like a little island surrounded on all sides by more fertile regions which the Jews could easily see from their homes. Generally their rough hills protected them from attack even though the armies of Egypt, Syria, and Assyria marched and fought on the Philistine plain only twenty miles away; but it was not so easy to guard against the temptation to give up the hard life on the infertile plateau and go down to the rich plains. So the Hebrews who had the least strength of character or the most love of adventure and of innovation were tempted, as Samson was, to leave stony Judea and settle in the richer regions from Egypt to Babylonia. The people who remained in the Judean hills, and became the ancestors of the modern Jews were those who had extreme persistence and were willing to endure comparative poverty for the sake of the ideals which they had set up for themselves. Thus a process of natural selection may have taken place, much like that which in Scotland under somewhat similar physical conditions has probably helped to make the Highland Scotch so sturdy and determined.

Another type of selection went on through deportation and persecution. The leaders were carried captive to Babylonia. When their descendants returned to reoccupy Judea it was only the more religious, and the ones like Nehemiah who stood most strongly for the old Jewish habits, that came back. During later centuries the Jews, like the Armenians, have been subjected to repeated persecution which has exerted a still further selective effect. Much of the trouble arises because the persecuted race has acquired a degree of industry and persistence greater than that of their persecutors. Each persecution increases this difference, for the less strong-minded Jews or Armenians give up their own religion and become parts of the surrounding community. Even now certain so-called Turkish or Kurdish villages of fanatical Moslems show their Armenian origin by retaining Christian customs such as the sign of the cross before meals. The loss of these

weaker elements has strengthened the racial character of the remaining Armenians.

Persecution weeds out certain types of people in still other ways. When massacres are carefully organized, as were those of the Armenians in Turkey, the first people to be killed are the ones who stand out boldly for their rights or are known as military or political leaders. When massacres are carried out by unorganized mobs, as in the Russian "pogroms," the mobs generally consist of the lower elements of the population. They massacre their neighbors while the able Jews who live in the better parts of the cities have more chance to escape. Thus the weaker elements of the persecuted race are killed off. A similar selection takes place in deportations. For instance, it is estimated that about a million Armenians were transported to the Syrian Desert from Armenia during the Great War. About 750,000 died and 250,000 wandered back. The American Red Cross physicians in charge of relief work say that in spite of their terrible sufferings and their months of semi-starvation the returning refugees were surprisingly strong and healthy. The weak had died—not only the weak in body but those with less competent brains. The people who survived were those who had tough physiques, who had the wit to pick up a living on the long, hard march to the desert, who bowed submissively when necessary but knew how to wheedle their persecutors into sparing or helping them. Thus the tendency of persecution and deportation is to weed out the military and political leaders on the one hand and the weak types on the other. This tends to create a strong, tenacious, homogeneous race with the qualities which we have described as most characteristic of the Jews. No race save one that has already acquired a strong fiber either through living apart in a relatively difficult environment or in some other way, can stand such persecution. And such persecution is likely to happen where one conquering race after another is forced into a land as has happened in western Asia. Thus the contribution of southwestern Asia to modern business conditions in America has been made through the Jews far more than through direct commerce. If we add to this the effect of the Bible in raising the standards of business, few countries have had a greater influence than Palestine.

EXERCISES AND PROBLEMS

1. The effect of size on Asiatic commerce. On outline maps of Europe and Asia respectively draw lines approximately parallel to the seacoast and 600 miles from it. Compare the areas enclosed by the lines in the two continents. What countries or parts of countries are found within these lines? How much of the area more than 600 miles from the sea has less than 6 inches of rain from June to August (Fig. 10)? How

does the similar interior area of North America compare with that of Asia in size? What effect do these conditions have on foreign commerce?

2. The difficulties of railroads in Asia. On an outline map of Asia draw lines showing to what extent it is now possible to go by rail from Moscow to Vladivostok, to Canton, to Bangkok, to Calcutta. Now draw lines showing how the most direct railways might reach these places. Make your railroads as straight as possible but with the necessary deviations in order to avoid the highest mountains.

For each road make a table showing: (*A*) the countries through which it would pass and also the probable cities; (*B*) the advantages of the route such as (1) a dense population, (2) abundant sources of food, raw materials or manufactured goods, (3) levelness, (4) friendly or progressive peoples; and (*C*) the disadvantages of the route, such as (1) mountains (general character, as high, broad, many ranges, etc.); (2) deserts, (3) sparsely populated forested areas, (4) probable difficulties of snow, ice, or floods.

3. Study the domination of Asia by Europeans in its agricultural aspects. On an outline map shade the Asiatic areas that are politically independent of Europeans. (Table 1 D.) What proportion of the total area do they form? What proportion of the important cities and ports of Asia (Table 4) do they contain? What is the significance of your answers to these two questions?

From Table 11 determine how abundant the crops are in the independent parts compared with those dominated by Europeans, but remember that China, for which few statistics are available, produces more food than India. Can you see any evidence in Table 11, and especially in Table 12, that European domination has increased the production of certain products desired by Europe? Note especially India and Siberia, and compare the two. Has European domination raised the yield per acre (Table 12) to a noteworthy extent?

4. The European domination of Asia in respect to minerals. India and China probably contain a far greater abundance and variety of minerals than any country of Europe; the East Indies, Japan, and perhaps the Malay Peninsula may rival Great Britain in the variety of their minerals, although having no such supplies of coal. Supposing the above statements to be true, and taking account of the number of people in the Asiatic countries and the need of European countries for minerals from their Asiatic possessions, what do you conclude as to the degree to which European domination has led to the development of the mineral resources of Asia (Table 25)? Study the number and amount of minerals produced in the Asiatic countries compared with European countries. Compare all Asia with the United States?

5. The effect of European domination on transportation and communication in Asia. From Table 35 B, C, E, F, and H, and Table 36 B and D, prepare a table with two parts showing the condition of Asiatic countries (*A*) under European or American control, and (*B*) under Asiatic control. Compare pairs of countries like India and China; the Philippines and Formosa; French Indo-China and Siam; Dutch East Indies and both Japan and Persia. From this exercise and the two preceding draw conclusions as to how deeply Europe's presence has influenced Asia, and in what respects the influence has been greatest. Remember that European influence is evident even without political control. How is this apparent in Exercises 1, 2, and 3?

6. Compare the foreign trade of Asia with that of other continents. From Table 38 determine the total exports and imports of Asia in 1923. In each of the other continents find areas with as small a population as possible which have a foreign trade equal to that of all Asia. Do the same for the trade of Asia with the United States.

What impression does this give of Asia's trade? List under each continent, and in the order of their trade per capita, the countries which have smaller per capita imports than Formosa. On a map of the world shade all the regions contained in your list. What strongly marked distribution of countries do you find, and what does it mean? Do the same for exports. What differences, if any, can you detect between your maps of imports and exports? Why?

7. Compare the rest of Asia with the southeastern part from Chosen and Manchuria to India, including the islands. Divide this problem among the class, letting different members determine the percentage of (*A*) population and area in each of the two sections (Table 1); (*B*) main crops (Table 11); (*C*) animals (Table 13); (*D*) minerals (Table 26); (*E*) means of transportation and communication (Tables 35 and 36); (*F*) foreign commerce (Tables 38, 39, and 40). Bring together all the available data and draw conclusions as to the nature of the products and degree of importance of the vast western, central, and northern parts of Asia, compared with the southeast. Show the geographical reasons for the conditions of these parts.

8. Adapt Exercises 5, 6, 7, and 8 in Chapter XXIX to Asia and work them out.

CHAPTER XXXI

INDIA AND THE FAR EAST

The Great Possibilities of Southeastern Asia.—The region from India to Japan may be called Southeastern Asia. Its relatively low latitude and heavy summer rains enable enormous crops to be raised. An area of approximately $2\frac{1}{2}$ million square miles in the more populous parts of India and China contains about 600 million people—35 per cent of the earth's population in less than 5 per cent of the total land surface. In the neighboring islands of Japan and the East Indies, and in the peninsulas of Chosen and Indo-China, an additional million and a half square miles support 150 million more people. Thus in southeastern Asia and the neighboring islands an area scarcely larger than Europe contains 60 per cent more people than that continent, or almost half the world's population.

The agricultural possibilities of this area surpass those of Europe, for in many places two or three crops can be raised each year. The coal and iron of China are only less abundant and easily worked than those of the United States or Europe. The great rivers, the deeply indented seacoast, the innumerable islands, and the comparative freedom from storms, except in the summer typhoon season, provide natural facilities for transportation even better than those of Europe. The rivers from the Ganges to the Hwang Ho might furnish waterpower such as is available in only a few other places. If the 750 million inhabitants could develop their coal, harness their rivers, build and run their own factories, extract the mineral wealth of the dry regions back of them, and guard themselves against the ever-recurring famines, the world might perhaps see an industrial development even greater than that of the United States or Europe.

Except in Japan, the people of southeastern Asia have thus far shown little promise of carrying out such a development. To-day the average foreign commerce of China per person is less than one-twentieth of that of the United States. Internal trade is equally sluggish. In industry this vast hive of humanity plays only a minor rôle, for outside of Japan most of the manufacturing is of the primitive type,—home industries, with here and there a plant for simple manufacturing run by Europeans

or Americans in order to prepare foodstuffs or half-manufactured raw materials for use in other countries. Politically, about half the people of this highly favored area are subject to Europe. Three-fourths of the remainder live in China, a country which is feebly struggling to keep its independence and to avoid being completely dominated by Europeans or Japanese. Siam, though nominally independent, is largely dominated by England and France. Among these 750 million human beings only the 60 million who live in Japan have genuine independence and a large share in the world's business because of their own initiative.

The Far Eastern Question.—With the growing unity of the world and the growing tendency for all active peoples to reach out and use the resources of other regions, it is inevitable that the wonderful possibilities of India and the Far East should be utilized. If the resources should be even moderately developed, and if the vast population should become even moderately able to purchase goods, the increase in the world's business would add enormously to the wealth of other nations. The realization of this makes the problem of the Far East extremely critical. The problem centers primarily around the question of who shall exercise political and commercial control in China? Shall it be Japan, the only energetic nation in that part of the world? Shall it be the United States, the strongest power that borders on the Pacific? Shall it be Great Britain, France, and the other European powers which already control about half of southeastern Asia? Shall India, China, the Philippines, Java, and the other parts of the Far East control their own destinies? Shall the League of Nations or some other association of the nations exercise control? Or shall China and other nations be self-governing parts of a great world state somewhat as Arizona, Oregon, and Maine are self-governing parts of the United States? In one or another of these ways the Far Eastern Question must apparently be answered. And the answer will be one of the most important factors in determining the course of the world's business. It will influence not only the Far East, but every part of the world.

India's Share in World Trade.—The part played by India in the world's business may be judged from the tables in the *Commerce Yearbook*. The first noteworthy fact is that India does not supply the world with much food. If we omit tea, valued at 106 million dollars, India in 1924 supplied foreign countries with less than 200 million dollars' worth of real food, more than half of which was rice, mainly from Burma. Canada, with only 9 million people against India's 315 million, supplied over 500 million dollars' worth of food. In other words, the value of the average Canadian in supplying the rest of the world with food is about seventy-five times as great as that of the average Indian.

On the other hand, India exported more than 300 million dollars' worth of cotton and more than 230 million of jute products. These two together comprised half the exports.

Another noteworthy fact is India's large export of raw cotton, oil seeds (chiefly for linseed oil), and jute. But compared with the population these quantities are small. Texas, with $4\frac{1}{2}$ million people, produces just about the same amount of cotton as all India. Hides and skins are a fairly abundant Indian product because India has a huge number of cattle. Nevertheless, India exports only a trifle more than Italy, not much over half as many as Argentina with its 8 million people, and less than the one small country of Belgium imports each year. The lac, or shellac, of India, although of relatively small value, is interesting as a gum secreted by insects. It is used for varnishes in the United States more than in most countries. (See Table 42.)

The manufactures exported from India are practically limited to the twisted fiber and thread of jute and cotton, or to coarse fabrics made from those products. By far the larger part is destined to be further manufactured in Europe before it reaches the final consumer. Thus three-fourths of India's exports consist of cotton, jute, oil seeds, and tea, either unmanufactured or only slightly and coarsely manufactured.

As to imports, if India does not supply the rest of the world with food, she at least demands little from outsiders except sugar. Her demands for raw materials are still more modest, except in the case of metals, which means chiefly iron. The imports that India wants are clothing, chiefly cotton, but some silk; and a relatively small amount of machinery, railway equipment, and automobiles, together with from one to three cents' worth per person of paper, books, glassware, drugs, soap, and the like.

The Reason for India's Scanty Trade.—The reasons why India plays so inactive a part in business may be partly racial, but they are probably much more economic and social. The tropical rice farmer described in Chapter XVIII represents millions of Indians, who have little energy, ambition, or education, who live so closely packed that they can scarcely get a good living from the soil no matter how competent they are, and who have practically no industry except agriculture. The people of India, however, display great differences because derived from many immigrant stocks. The quick energy of the Sikhs in battle is famous, as is the anemic lassitude of the slender Bengali. Great business capacity and high mechanical ability are rare, although small groups are very competent, and many Bengalis, for example, are good traders. The Parsees of Bombay, a remnant of the Fire Worshipers who were driven from the towns of Persia, are uncommonly good

business men. They are active in the cotton and jute industries, two of the few lines where a moderate amount of manufacturing has been started. Some of the upper-caste Brahmins are intellectually of high caliber. Men like the poet Tagore command respect everywhere. Yet even in such men, imagination, poetic instinct, and the power to philosophize are usually more highly developed than are the qualities of steady, laborious work and the painstaking scrutiny of facts which are necessary in modern science, or the power of quick decision and energetic action which are especially needed in modern business.

One of the greatest hindrances to the economic development of India is repeated famines. India depends almost wholly on the monsoon rains which begin anywhere from April in the south to June in the north, and last till September or October. If the rains are delayed or do not last long enough, as happens frequently, the crops may fail. Such calamities not only kill millions of people through hunger and the fevers that usually follow, but also check the accumulation of capital. In the extremity of famine the poor peasants and many of the townsmen sell anything. Worse still, they acquire a hopeless spirit of resignation which is fatal to progress. Their great idea is not so much to improve their farms and increase their working capital, as to lay aside coins and jewelry which can be sold in time of famine, but which have little value in stimulating industry, commerce, and other forms of business. Under the tutelage of Great Britain, India's business is indeed increasing, but the character of the people does not seem to be appreciably changing. It is doubtful whether it will ever change until disease, malnutrition, and anemia are eliminated and education has a chance to develop among a people free from physical handicaps.

Britain's Relation to India.—The industrial and commercial expansion of India is generally believed to depend on intelligent direction by Europeans. Many people think that India, if left to itself, would go back to chaos. Great Britain wants to retain India. A large number of British fear that the loss of India would destroy the British Empire even though the trade with that country amounts to only about 12 per cent of Britain's total. On the other hand, the Indian nationalists claim that India could govern itself peaceably and make more progress without British help than with it. Those who actively support this claim are a small group of the brighter minds who have acquired European education, who are able to write cleverly, and who are themselves eager to control the masses. In spite of their small numbers they create considerable discontent with British rule. Boycotts of British goods have been tried and may be tried again.

Probably the export of cotton manufactures and steel goods to India

and the import of tea, oil seeds, jute, and cotton are not so essential to the British Empire as the English think. Probably India is not nearly so able to rule itself as the Indian leaders would have us believe. Certainly the vast irrigation system and the many railways which the British have built, and the famine relief which the Government has established have done much to save life and prevent distress in times when the rains are scanty and the crops fail. Left to themselves, the people of India would probably never have done these things, and it is doubtful whether they could maintain them long or greatly improve their industrial system without outside aid. Altogether the problem of how Europeans can aid in the development of India with profit both to that country and themselves is one of the most puzzling that now faces the British Empire. The fundamental need is wise cooperation between Europe and Asia, and mutual respect of each for the good qualities of the other. America's part in all this is small compared with Britain's, for less than a sixth of India's business is with this country, while nearly two-fifths is with Britain. Nevertheless, in 1923, we received from India as much as from all of Latin America between Mexico on the north and Brazil and Chile on the south.

The Trade and Possibilities of China.—China is even more populous than India. Its natural resources are probably greater because of its well-watered plains and fine coal. Its natural transportation facilities are better than those of India because of its good harbors and great navigable rivers. Most important of all, its people are generally considered more industrious, thrifty, energetic, and intelligent than the Hindus. Yet before the Great War, China's foreign trade was scarcely half that of India. Only in later years have the two countries approached an equality.

FOREIGN TRADE OF CHINA AND INDIA

	China	India
1914	$612,000,000	$1,387,000,000
1915	548,000,000	1,053,000,000
1919	1,736,000,000	1,324,000,000
1923	1,399,000,000	1,725,000,000

The variety of exports from China, as given in the *Commerce Yearbook*, is somewhat greater than from India. Silk, bean products, cotton, tea, and coal comprise the great bulk of China's contribution to world trade. A little of the exported silk is manufactured, but the total amount of manufactures is almost negligible. The chief rôle of China, as of India, is to furnish raw materials. The foreign purchases of the two countries are also alike. Neither buys much food, but both demand

a large amount of cheap textiles and clothing, together with machinery, metal goods, kerosene, and a little of other kinds of manufactures. Both import sugar, and China in 1923 imported more than 130 million dollars' worth of rice, wheat, and other foodstuffs.

In spite of the fact that the trade of China as well as India is small per capita, the vast number of people and the possibilities of future expansion make it one of the most valuable prizes for the active commercial and industrial nations. In India the development of the country for a hundred years by the British has to a considerable degree opened up the possibilities, but in China development has only begun. Suppose China should increase her 6000 miles of railways to equal the 37,000 of India, and should improve the natural waterways, control the floods, provide insurance against famine, harness the water power, construct mills, direct the vast supplies of steady, reliable Chinese labor, open up the great coal and iron deposits, and explore and develop the mineral resources of the great plateaus and deserts of the interior. Suppose also that China were to supply her own greatest need in the way of raw materials by bringing wood from the vast forests which border the Siberian coasts and rivers, or from the richly forested tropical islands of the south. Suppose that China were to remedy the chief lacks in her food supply by bringing dairy products and wheat from southern Siberia, beef and mutton from that same region and Central Asia, and fish from the richly stocked ocean off the Siberian coast. Suppose modern science were to eradicate malnutrition, malaria, the hookworm, and other ailments which hamper the Chinese and help to make them slow. And finally suppose modern education were to become universal and thus increase the naturally keen capacities of the Chinese.

If all this were to happen, and there is no reason why it should not, it would be enormously profitable not only to the Chinese themselves, but to foreigners. Other nations recognize this possibility. They also realize the abundant supplies of staple raw materials that can be procured in China and the vast market which she would furnish if once drawn into the paths of modern industrial and commercial development. Hence arises the main problem in the Far Eastern Question, namely, who shall control China and how?

So far as mere volume of trade is concerned, a partial answer to this question is found in the accompanying table. The first two columns show that between 1913 and 1923 there was a relative decline in the Chinese imports from the European countries and from Hongkong, which chiefly delivers British and other European goods to China. There was a corresponding increase in the imports from the United States and to a slight degree from Japan. The same was true of exports,

except that the increase to Japan was large. Of course the war had much to do with this, but part of the change due to the war will probably be permanent.

PERCENTAGE OF CHINESE TRADE WITH FOREIGN COUNTRIES

	Percentage of Imports Derived from Regions Named		Percentage of Exports Sent to Regions Named	
	1913	1923	1913	1923
Hongkong	30	26	29	23
Japan	21	22	16	26
Great Britain	17	13	4	6
United States	6	10	9	17
Germany	5	3	4	2
Russia (Siberia)	4	1	11	5
Belgium	3	..	2	..
France	1	1	10	5

Japan, the United States, and Great Britain have the greatest interest in Chinese trade. Those three countries played the chief part in a Conference which met in Washington in 1921, and framed new treaties dealing with the regions bordering the Pacific Ocean. The United States and Great Britain insisted upon what is known as the open-door policy, and Japan agreed to it. According to that policy all foreign countries have equal rights and privileges in China. At the same time China must be helped to preserve and maintain her own government and to quiet the internal quarrels which have distracted the country since it became a republic in 1912.

The Relation of Japan to China and to World Trade.—In the problem of the Far East, Japan is the main active factor, just as China is the main passive factor. The foreign trade of Japan shows this clearly (See *Commerce Yearbook*). In ordinary years the exports of food products, aside from tea, form less than 3 per cent of the total exports, and consist mainly of refined sugar raised originally in Formosa, and cuttlefish, seaweeds, and peas. Raw materials are likewise scarce among the exports. Silk, to be sure, forms about 40 per cent of the total exports, but the other exported raw materials are almost wholly limited to coal (which forms about 2 per cent of the value of the exports), and camphor (less than 1 per cent). Among the imports, on the contrary, food comprises about 20 per cent of the value, while raw cotton comprises 26 per cent;

semi-manufactured iron, 11 per cent; lumber, 4 per cent; wool, 4 per cent. These figures illustrate the fact that Japan has now gone far toward becoming an industrial nation, although agriculture is still the main industry. Her trade has the same qualities as that of Great Britain except that she does not yet import so large a proportion of food. But she is tending in that direction. She wants food and the raw materials needed to maintain and enlarge her factories. She wants great markets where she can sell the products of those factories. Chosen and Manchuria are not enough. China has just what she wants, and China is close at hand. It is not surprising that Chinese trade amounts to about 14 per cent of Japan's total, while the corresponding figure for the United States is only 4, and for Great Britain 2, or $2\frac{1}{2}$ if the trade from Great Britain via Hongkong be included. In other words, China's trade is the largest single factor in the foreign relations of Japan. The Japanese feel that they are the natural people to develop China and provide the education, the science, and the leadership that China now lacks. The main problem of the Far Eastern question is how can Japan develop a program of reasonable industrial, commercial, and financial expansion, while China also has a free opportunity and the rest of the world has a fair chance. The only answer lies in close friendship and cooperation with one another and with China on the part of the three great maritime nations, the United States, Great Britain, and Japan.

The Contrasted Character of the Chinese and Japanese.—The reason why Japan and China play such strongly contrasted parts in the Far Eastern Question, and thus in the business relations of the world, is found partly in certain deep-seated differences of character. The Japanese, though small of stature, are an unusually alert, wideawake people. While not so inventive as the Nordics, they are very quick to recognize and adopt a good thing when they see it. One of the most notable facts in world history has been the speed and thoroughness with which the Japanese, as soon as western ideas were brought to them, recognized their value and began to profit by them. This does not mean, as many people suppose, that the Japanese were barbarians before Commodore Perry induced them to make a treaty with the United States in 1854. Contrary to what is often stated, they were then, as now, by far the most progressive people of Asia. For centuries they had been making gradual progress and when they saw that western science and industry were good, they quickly adopted them. Not all the Japanese, however, have this progressive spirit. There is a great contrast between the relatively conservative masses of the people, and the quick-minded, capable leaders belonging largely to the old nobility and the Samurai or warrior class. In other words, Japan has a large

body of industrious, conservative peasants who make good sailors, factory operatives, and manual workers, and she has a relatively large number of progressive, competent leaders.

In China the case is different. Many people think that in real ability the Chinese are the equals of any other race. But almost everyone agrees that China as a whole is extremely conservative. The common people, especially in the north, are so wedded to old customs that it is almost impossible to change them. Moreover, China's relatively democratic form of social organization helps to cause this conservatism to be shared by the leaders. In Japan the Samurai married only among themselves and thus retained the qualities of leadership which originally raised them to their high position. In China a system of universal education and public examinations made it possible for the son of the poorest peasant to rise to positions of importance. This has had some excellent results, but it has tended to make the leaders conservative like the peasants.

With this conservatism goes a deplorable lack of public spirit. This is one reason for the inefficiency and corruption of the Chinese Government. The officials rob the public treasury more systematically and openly than in most countries, not because they are especially bad, but because the mass of the Chinese are so callous to all matters that do not immediately touch them, that almost no one raises a protest. Hence business is greatly hampered because its success depends very closely upon the quality of the government. The best governments are the most criticized. England, for example, hears constantly from her people that she is being ruined by this or that defect of government, while China hears little about her own defects. Hence abuses are remedied in England, but continue and grow worse in China.

The Japanese, on the contrary, have a much stronger tendency to look after the public welfare. An illustration of this is the hara-kiri, or custom whereby it was considered right and noble for a Samurai to kill himself if he failed in some public duty.

Certain other prominent Chinese traits are intense economy, great thrift, wonderful patience and endurance, and the capacity to live on the smallest possible allowance of food. These qualities are very valuable except that they are usually accompanied by undue conservatism. It is partly this spirit of conservatism, joined with skill in certain respects, which makes the Chinese so wonderful in their ability to make exact copies of anything that they have once carefully examined. If an American tailor is given a coat and told to make one like it, he often suggests making the new coat different from the old one. A Chinese tailor, on the other hand, was once given a coat in which a large torn

lace had been mended in the back, and told to make a new coat of the ame kind. He made it, and tore a rent in the back and sewed it up. Ie did not think of making any change in the coat.

Some Reasons for the Difference between Chinese and Japanese.—Ve have already seen that one reason why the Chinese are less ready han the Japanese to adopt new methods is the social system whereby ne students who could best pass examinations in the Chinese classics ave been the ones who have risen to the top and become leaders. low, patient labor and a vast amount of memorizing were the quali-es which gave success in the examinations. Among the Japanese, on ne other hand, the ones who rose to be leaders were usually those who owed initiative in war or in pushing themselves to the top by active fort. Famines are another agency which has helped to make the hinese more conservative than the Japanese. These are especially vere in North China because spring droughts and summer floods often cur together. Practically all of North China has less than an inch rainfall per month from October to April, and only in May does the in begin to be abundant enough for agriculture. If the beginning of ne rains is delayed, as happens not infrequently, the farmers who depend nly on rain may be able to raise almost nothing. The many who depend n irrigation, however, do not suffer so much. But then comes the cond trouble: when the rains finally burst, they usually fall in showers great violence. Since the spring droughts hinder the growth of trees n the mountains, and the Chinese have cut their forests recklessly, ne rain pours down the hillsides, and floods the fertile, irrigated low-nds, esepcially the great flat plain of the Hwang-Ho, so that the crops e often ruined.

Such famines often throw scores of millions of people into danger om starvation. Here, as in so many other cases, Nature applies her rinciple of natural selection. The only way to survive in a Chinese mine is either to stay at home and eat very sparingly until new crops n be raised, or to wander away to distant regions where the famine is ss severe. In either case the people who combine intelligence and hysical vigor are the ones most likely to survive. But suppose two en are alike in these respects, but one has a nervous, active tempera-ent and wants to be doing something while the other is slow, steady, d careful. Americans who have had experience in Chinese famines y that a man of the first type is likely to migrate to the city or to some stant region where there is no famine. If he and his family go to the y, their descendants gradually die out. Even in the United States, th all our public health measures, the urban death rate, in states where e cities have no special advantage such as a location near large bodies

of water, is about 25 per cent greater than the rural death rate. In China the urban death rate is so high that the city population would presumably die out if people from the country did not constantly migrate cityward. So the energetic and active Chinese whose descendants should become inventors and leaders are largely lost either through the high death rates of the cities or through migration to other regions.

On the other hand, the family that is exceedingly careful, cautious, and economical survives. During a famine such a family stays at home, sleeps till the middle of the morning so long as there is no work, eats a single scanty meal at noon, and lies down again in the middle of the afternoon. Famine workers describe exactly this process again and again:—the more active people moving to the cities or to other regions, the slow, conservative, economical, thrifty, and hardy ones remaining behind to build up the next generation, and the weaker people dying. Thus the famines have helped to produce some of the best racial qualities of the Chinese as well as some of the defects which play so important a part in determining the business relations of the Far East.

In South China, where famines are rare, the Chinese are much more progressive and active than in the north, which is one reason why most of the Chinese in America are Cantonese. This also helps to explain why foreign trade is more active in the south than in the north, although relative nearness to India and Europe is also important. In the revolutionary troubles after the establishment of the Chinese Republic, North China was consistently conservative and reactionary, and wanted to restore the old imperial regime, while South China was progressive.

In Japan the geographical environment has acted in quite a different way. The protection of the ocean has allowed Japan to develop without being overrun by nomads as has happened to China. The presence of the ocean and the many fine bays, combined with the rough character of the land, has also made the Japanese take to seafaring far more than has been the case with the Chinese. People who go to sea upon stormy waters such as those around Japan gradually become relatively bold and adventurous. They seem to have a gift of leadership and the ability and willingness to follow their leaders, partly perhaps because those who have not these qualities are more likely than the others to perish in storms. A process of natural selection seems to give an advantage to the seafaring people.

Again while Japan sometimes suffers from poor crops, its rains are derived from cyclonic storms at all seasons as well as from the monsoon rains in summer. Hence there are never famines of such severity as in China and there is no such severe process of natural selection whereby

he energetic ones are driven out, and the thrifty, conservative people emain. Moreover, as we saw in Chapter IX, Japan is the one country f Asia which enjoys a climate approaching that of western Europe nd the United States in its healthful and stimulating qualities. Thus apan has a great many advantages which give her energy, leadership, nd the power to expand and to dominate other people, while China's ine qualities, although perhaps equally valuable, tend toward the uieter virtues and make it hard for her to introduce new methods, and tand up against energetic foreigners.

EXERCISES AND PROBLEMS

1. Make a map of Asia showing the distribution of population. This can be lone in several ways: (*a*) by inserting in each country a bar proportional to the umber of inhabitants; (*b*) by inserting a dot on the map for each 500,000 or ,000,000 people; (*c*) by making a solid square in the country, the area of each quare being proportional to the number of inhabitants in that country; (*d*) by sing different symbols for different numbers of people as in Fig. 125. Let various nembers of the class try different methods. Which is the most effective?

2. Find out what the foreign commerce of Japan and Great Britain indicates s to the relative economic condition of the two countries. On a map of the world lraw arrows from Japan and from Britain to represent the three classes into which British commerce is usually divided: I. Food, drink, and tobacco. II. Raw materials. III. Manufactured articles. Let the lengths of the arrows be proportional to he values of the respective classes of commodities in each of the two countries. Base your work on *The Statesman's Year Book* and the tables in this chapter. Omit foreign nd colonial produce, count coal and pig iron as raw materials. Make separate naps for exports and imports. Point out the resemblances and differences (*A*) of he two maps, (*B*) between Japan and Great Britain in each map. What do the naps indicate as to the relative economic development of the two countries?

3. From Table 9 compare the use of the land in British India and in Japan. In vhat respects does each excel? How far can you account for the differences by physical characteristics? Compare these countries with others in Table 9 and prepare what you would consider an ideal method of using the land. Which Asiatic ountry comes nearest the ideal?

4. From Table 11 and the tables of exports and imports in *Commerce Yearbook* gure out the per capita consumption of staple foods in Japan and India. This is posible by adding the production of any staple to the amount imported, subtracting the xportation, and dividing by the number of inhabitants. How do the figures which ou obtain compare with those for Great Britain and the United States? Can you xplain the differences by any physical characteristics of the respective areas?

5. According to Table 13 there is a marked difference in the number of animals n India and Japan. Account for this great variation. Study the optima for the earing of cattle and see how far an explanation along this line is feasible.

6. Use Table 26 as a basis for comparing the mineral production of India, China, nd Japan with that of your own country and state. Construct graphs exhibiting he comparisons.

7. On a map of the world plot the number of cotton spindles per thousand people (Table 29), and insert four degrees of shading according to the intensity of the cotton spinning industry. How far does the map give a true idea of the per capita consumption of cotton by each of the leading countries? In the section on "Statistics of Cotton" in the *Yearbook of the U. S. Department of Agriculture* use two of the tables as the basis for computing the per capita consumption of *raw* cotton in the leading countries. Why is the word raw in italics?

From Table 30 construct a map of the U. S. similar to your world map of cotton spindles. In what parts of the United States is the cotton industry comparable with that of India and Japan?

Plot on a map of the world the movement of cotton (raw) to the spindles. Would you call cotton a commodity of much importance from the standpoint of commerce? How does it compare with wheat? Rice? Corn?

8. Use the European exercises of Chapters XXVIII and XXIX as the basis of problems on Asia to be given to the rest of the class for solution.

9. Obtain all possible statistics for China in this book, in *The Statesman's Year Book*, and in the encyclopedia. Use them as the basis for an account of the business geography of China. Introduce your account by an explanation of the nature of the difficulties that you meet.

CHAPTER XXXII

AFRICA: THE CONTINENT OF EUROPEAN EXPLOITATION

The Meagerness of Africa's Business.—From the standpoint of business, as in other respects, Africa is the most backward of the continents. A partial measure of this backwardness is found in the foreign commerce. The total exports of Africa, with its 12 million square miles and 130 million people, amounted in 1923 to 1770 million dollars or $13.60 per person; those of Australia and New Zealand (3 million square miles and only 6 million people) amounted to 1540 million dollars, or about $258 per person.

The inactivity of most of Africa becomes still more evident when we compare the small portions which contain a fairly large number of Europeans with the vast remainder which appears at the end of the following table:

	Area Square Miles	Population	Exports, 1923	Exports per Capita
unis	48,300	2,094,000	$70,234,000	$33.60
lgeria	222,100	5,806,000	155,640,000	26.80
gypt	12,200	13,451,000	212,445,000	16.90
nion of South Africa	473,100	6,929,000	253,139,000	36.10
emainder	11,000,000	105,000,000	203,000,000	1.93

The scarcity of exports in the main part of Africa is the more remarkable when we consider that, except for the remote plateau of Abyssinia and the little country of Liberia, the whole region is under the rule of Europeans who are eager to develop tropical trade. The causes of Africa's economic backwardness are found partly in the lack of deep indentations and harbors on the smooth coast; partly in the rim of mountains which almost everywhere borders the continent and causes rapids and falls in the rivers; and partly in the poverty of the soil, which in large areas within the tropics is of the poor lateritic type. Still more important is the climate, for both in the Kalahari and far more in the Sahara vast regions are desert, while large areas within the tropics are

extremely enervating to the natives as well as to Europeans. These geographic conditions appear to be the main reasons for the concentration of many kinds of backwardness—social, cultural, and economic—in the equatorial parts of Africa. The ignorance, superstition, idleness and other weaknesses which thus arise make the people of Africa on an average more inefficient than those of any other continent.

The More Active Parts of Africa.—The really active part of Africa comprises three small areas in the extreme north and south. There the climate permits the white man to live in comparative health and comfort. (*a*) The French colonies of Algeria and Tunis are so near France that fruit and spring vegetables can be shipped to Paris almost as easily as from Florida or Cuba to New York. (*b*) Egypt not only possesses a limited area of land rendered extremely fertile by irrigation from the Nile, but lies near the Suez Canal, perhaps the most important of all artificial waterways. This great highway from Europe to India is of such vital importance to the British Empire that England feels that she must hold it. Moreover, the long-stapled Egyptian cotton is of such an unusually good type and the yield per acre is so great that it has been worth while for Britain to invest large sums in great irrigation works at Assuan and elsewhere. Nevertheless in 1922 Britain deliberately gave Egypt its independence, retaining only the right to guard the canal, protect foreigners, and interfere in case of certain domestic disturbances. The relation of Egypt to Britain is much like that of Cuba to the United States.

(*c*) South Africa is remote compared with Algeria and Egypt, but its subtropical position, the altitude of its plateau, and the presence of great gold and diamond fields help to make it a place where the British have put forth much effort. There the presence of a million and a half white people, chiefly of English and Dutch descent, has led to self-government in the form of a Dominion of the British Empire.

The nature of the business and the mode of life of these three active parts of Africa as compared with the remaining 11 million square miles is illustrated by their exports (see *Commerce Yearbook*). The portions of Algeria, Tunis, and Morocco north of the Atlas Mountains are inhabited by small farmers living in compact villages. The topography is relatively rugged, and the rains, though limited to the winter, are far more abundant than in the neighboring desert. The advantages of these conditions and of nearness to Europe are evident in the fairly well-balanced quality of the French North African list of exports which represents all the great classes of products aside from manufactures. Such a list is typical of a long-settled region of small farmers living in compact villages in a fairly mountainous region with winter rains and

summer droughts, and with desert areas close at hand. The high proportion of barley compared with wheat indicates that here we are close to the border of the climatic zone where wheat can grow, for barley is a product of poor climates as well as of poor soils. The noteworthy development of the products of trees, bushes, and vines is characteristic of the Mediterranean climate. In view of the fame of North African dates it is surprising to find that they occupy a negligible place. The production of tobacco is about what might be expected, but the fame of esparto grass as a material for ropes, baskets, mats, sandals, and paper would lead one to expect a much larger production. Esparto grass and dates illustrate the fact that popular books and magazine articles often emphasize minor but picturesque products, and say little about the great staples which are of chief importance in commerce.

The animal products in the list of exports from French North Africa indicate that sheep are the most important animals, as is natural in a dry, mountainous region. Among the forest products timber seems to be unexpectedly important until one remembers that the high mountains are covered with forests among which cedars like those of Lebanon are especially interesting. Cork is produced here for the same climatic reasons which make it a great product of Spain and Portugal. The production of minerals is in accord with the dryness of the climate and the mountainous character of the country, which cause ores to be easily found and often make them abundant. A region that has phosphates for fertilizer, as well as metals, is fortunate.

Here, and in all parts of Africa, the imports are almost entirely manufactured goods, except for a certain amount of coal, lumber, tea, coffee, and minor products. Among manufactured goods, cotton cloth, clothing, machinery, and other metal work usually hold the highest place. The variety in the imports from region to region is much less than in the exports.

Now compare the products of Egypt and the Union of South Africa with those of the French provinces. Egypt with its preponderance of cotton and cereals illustrates the effect of irrigation and intensive agriculture in a country with deep, level soil, great aridity, high temperature, few trees, and a dense population. Egypt has the disadvantage of having only one important cash crop. Irrigation, to be sure, makes the yield of cotton quite steady from year to year and also very large per acre, but that does not prevent great fluctuations in price such as occurred during the Great War, or such as occur when the American crop is unusually large or small. South Africa is no better off, for its exports of vegetable products are negligible, while the enormous preponderance of gold and diamonds does not tend toward permanent

progress. The importance of wool, ostrich feathers, and hides, as well as of minerals, on the South African list of exports shows the effect of aridity, mountains, recent settlement, and the absence of opportunities for agriculture.

The Business of the Inactive Part of Africa.—The rest of Africa may be divided into four main sections. First, vast areas in the north and smaller ones in the southeast are deserts. These are places where commerce is almost absent, for there are neither people nor agricultural resources. Next comes a band of steppes which border the Sahara on the south in the Sudan, swing around into the peninsula of Eritrea and Somaliland on the east, and reappear surrounding the Kalahari Desert. Here the people are largely nomadic keepers of cattle who do little except supply their own simple needs.

South of the Sudan and along the plateaus of the eastern part of central and southern Africa lies a more important zone of grassland or savanna studded often with trees, and in many places cultivated, or else supporting a considerable number of cattle. Here live the most active and progressive of the Negro races of Africa. Here, too, the coolness of the high plateaus holds out hope that the white man may ultimately be able to live permanently. Nevertheless, among the chief products only gold, gums, and copper come from this region. The savanna regions with their abundant grass, their scattered thickets and groves, and their so-called gallery forests lining the water courses are the home of many of the animals of Africa—the lion, leopard, hyena, and jackal; the elephant, hippopotamus, and giraffe; and most numerous of all, the many kinds of antelopes.

Finally along the Equator in the western part of Africa a zone of dense tropical forest represents what most people think of as typically tropical. It is a region where the white man hesitates to live for any length of time for fear of fever, and where the black man is inefficient. Nevertheless, it yields some of the main products of the vast backward portion of Africa, namely, coconuts, palm oil, and cocoa.

The Great Business Problems of Africa.—(1) *Transportation.*—A little study of the exports of Africa shows that they practically all come from within less than 400 miles of the seascoast. This is true of practically everything exported from French North Africa, Egypt, and South Africa. In the rest of Africa the greatest of all products is the palm nuts which grow along the coasts in equatorial regions. Cocoa and other plantation products of trees and bushes also come almost wholly from the coast and from the outlying islands such as Zanzibar, Madagascar, and Saint Thomas. The difficulty and cost of transportation prevent much trade with the interior. Some railroads have indeed been built but

progress is slow. It does not pay to build railways across vast deserts, through deadly forests, and up the side of a lofty plateau in order to reach regions where the people are so few or so inert that there is no assurance that they will supply many products that the railroads can carry. That is one reason why the completion of the Cape to Cairo railroad is still delayed.

(2) *The Lack of Demand.*—We saw in an earlier chapter that business arises only where there is a demand which can be satisfied by a supply of some kind of goods. In Africa the demand for the goods of the great manufacturing countries of the other continents is slight. The people live comfortably enough according to their own standards. They do not need expensive clothing, houses, and furniture. They are satisfied with their own kind of food. On the other hand, the demands of the world for the products of Africa are not yet so insistent as to overcome the difficulties due to the African climate and the stage of human culture. The demand for palm oil, copra, cocoa, rubber, and other main articles which the great central part of Africa is chiefly able to supply can be met more easily in the tropical regions of southeastern Asia, the East and West Indies, and northern South America than in central Africa. Those regions are more accessible than Africa because of the relative length of their seacoasts in proportion to their area. So long as they can supply the world's demands, Africa is likely to be neglected. The United States almost completely neglects Africa, the exports to this country amounting to only 3 per cent of the African total. We satisfy our need for tropical products almost entirely in other regions.

(3) *The Inadequacy of Labor.*—Tropical labor is well known to be inefficient, the reason being largely the actual physical incapacity of the people to work in the northern fashion. With this goes the fact that they have few needs and hence have little desire to work. Africa is particularly handicapped in this respect. The Negro races of tropical Africa will often work much better out of loyalty and affection for their foremen than from any desire for more pay. In fact, kindness and good humor will often persuade the Africans to work heartily for long hours when a mere offer of pay or any attempt to compel them to work has the opposite effect.

(4) *The Health of the White Man.*—The same conditions which make the Negro inefficient weaken the white man. In the old days a popular rhyme among sailors went as follows:

> "Beware of the Bight of Benin.
> Few come out, though many go in."

Even now, with all that has been done in medical science, the white man cannot live permanently on the equatorial coasts of Africa. Whether he can live in the highlands is still a disputed question. Certainly his health suffers there far less than in the lowlands, but it is still doubtful whether there can be any genuine white colonization on a scale such as in South Africa, where there is one white man to four natives, or in Algeria, where the ratio is one to six. Unless there is a fairly large white population it will be difficult for Africa to hold any great place in the world's business, especially while there are such undeveloped possibilities in tropical regions that are more easily accessible. But even if Europeans should settle in Africa there is grave danger that in competition with the black men and under the influence of the unfavorable climatic and social environment many of them would deteriorate into "poor whites." Even in South Africa this has happened to a dangerous degree, and many of the less competent whites are being displaced by blacks. This gives rise to the most serious problem of that dominion. Europe took possession of Africa because of its natural resources on the one hand and the weakness of its political system on the other. And Europe finds that tropical Africa is on the whole a burden. Yet the countries of Europe have been willing to fight for possessions in that continent.

EXERCISES AND PROBLEMS

1. Study the relative advantages of the parts of Africa belonging to various European countries. On an outline map insert the population per square mile from Table 1, apply separate colors or shades to the independent portions and to those belonging to each of the principal powers. Analyze your map to determine the following points: (*A*) What proportion of Africa is self-governing? How does this proportion compare with that belonging to each of the other dominant countries? (*B*) What conditions have promoted independence or caused one European power rather than another to control parts of Africa? (*C*) How do the holdings of the various European countries compare with one another and with the United States in (1) area, and density of population (Table 1), (2) number of large cities (Table 4), (3) total foreign commerce and commerce per capita (Table 39). Sum up your conclusions as to the relative advantages of the European nations in Africa.

2. Adapt Exercises 5, 6, 7, and 8 in Chapter XXIX to Africa so far as possible. Put these exercises into proper form to be given to your classmates.

3. Adapt Exercises 6 and 7 of Chapter XXX to Africa, but in Exercise 7 divide Africa into the relatively progressive north and south parts and the unprogressive center as explained in this chapter.

4. Tabulate the exports and imports of various parts of Africa in such a way as to illustrate and amplify the statements given in the text. Use the *Statesman's Yearbook* and *Commerce Yearbook*.

CHAPTER XXXIII

AUSTRALASIA AND THE PROBLEM OF ISOLATION

A Comparison between Australia and North Africa.—Australia is much like the part of Africa north of latitude 10° N. Each region has a small section in latitudes higher than 35° where the climate is of the Mediterranean type with rainy winters and dry summers. Equatorward of this in both cases lie dry grasslands which soon merge into vast deserts. Still farther toward the equator grasslands again appear while the lowest latitudes have abundant rain. Both regions are also alike in having an eastern rim of mountains and a west coast which is mountainous in the better portions although the mountains break down where the desert is most intense. Likewise on the poleward coast both Australia and Africa are partly mountain-girt, but have long sections where the mountains are absent and the desert reaches the ocean. Because of the resemblance in climate the two regions are similar in their occupations, their agricultural products, their dependence on animals, their use of irrigation, and many of their exports and imports.

On the other hand Australia has certain advantages arising largely from the fact that it stands isolated in the midst of the ocean. For this reason the east coast of Australia receives abundant rain from the southeast trades, and Queensland is well watered, while Egypt is a desert except where irrigated. On the equatorial side of Australia the presence of the ocean likewise causes more favorable conditions of rainfall than in similar latitudes on the southern side of the Sudan and Abyssinia. Again the fact that Australia is smaller than Africa and is not connected with other great land masses gives it a more oceanic climate. This is especially true if New Zealand be included with Australia. Added to all this is the fact that Australia and New Zealand exceed Africa in the area of the portions more than 35° from the equator. New Zealand, lying between 35° and 47° south of the equator, is in a different climatic province from Australia, and has the advantage of fairly frequent cyclonic storms, especially during the winter.

Another advantage of Australia is that although the Australian coast is much less favorable than that of Europe or even North America,

it has many more indentations, gulfs, bays, and harbors than that of Africa. Still more important is the fact that when the white man first penetrated Australia, the number of native inhabitants was almost negligible. Hence the continent was open to white colonization. At first the British unfortunately made Australia a penal colony and some highly undesirable elements were thus introduced. Later, however, the type of colonist was unusually high. The great distance of Australia from Europe, and the expense of getting there eliminated many would-be settlers because they had neither the courage nor the means to go so far. New Zealand was especially fortunate in this respect, for many of its early settlers belonged to religious organizations of unusually high character. Because Australia is so completely ocean-girt and can only be reached by a long sea voyage, people other than the sea-faring British have gone there only in small numbers. This fact and the scarcity of natives prevents Australia from having a race problem like that of the English, Boers, and Blacks in South Africa. Thus in the type of inhabitants, as well as in climate, the fact that Australia and New Zealand are isolated from the rest of the world has been an advantage.

The General Conditions of Australasian Business.—Because Australia is inhabited by such homogeneous and competent people, the economic and social conditions are unusually favorable. This is evident in the minimum-wage laws of Australia, its old-age and invalid pensions, the large cooperative enterprises, especially in New Zealand, and the uncommonly high standards of sanitation and public health. Another factor which has greatly helped Australia has been the rapid development of navigation during the past hundred years. So long as sailing vessels were the only means of reaching that continent, its isolation tended to limit trade and keep the country backward. To-day the cheapness and relative speed of steam navigation make it almost as feasible to ship goods from Australia to England as from New York to Chicago. At the same time the airplane is rapidly making it possible to fly from Melbourne to London as quickly as one can go by water from London to New York. Moreover, the telegraph and wireless furnish information to Australia almost as fully and promptly as to any part of the world. Thus, while Australia has reaped the advantages of her long isolation most of the disadvantages are now largely neutralized.

The Nature of Australasia's Commerce.—The most notable feature of the exports of Australia and New Zealand is the great preponderance of animal products, especially wool. Wheat and flour also figure largely in Australia, but New Zealand turns more to dairy products as is natural in its relatively cool and fairly moist climate. Even in Australia,

which is one of the world's famous mining regions, the total production of gold and of all other metals is only a fourth as valuable as the exports of animal products, if we include manufactured as well as unmanufactured goods. Nevertheless, in the high value of its minerals Australia ranks with South Africa, Arizona, and other arid regions.

Another important feature of the Australasian table of exports is that it shows a higher stage of development than prevails in any part of Africa. Australia and New Zealand, to be sure, do not have quite so well-rounded a list of exports as has French North Africa, but that is probably in large part because of their newness. But the fact that the Australasian exports include many manufactured products indicates a healthy industrial development. Australasia has not yet reached the stage where it imports large amounts of raw material and carries on complex manufacturing, but it is actively engaged in the simple industries which convert hides into leather; milk into butter, cheese, and condensed milk; and fruits into jams. Such work is probably the forerunner of complex industries, for there is already a beginning along this line. The Australasians have the capacity for such industries and have abundant raw materials which they might well use instead of shipping them five or ten thousand miles and bringing them back in manufactured form.

The list of Australasian imports is remarkable chiefly because of the large values. So long as a people devotes itself chiefly to primary production and to the simpler kinds of manufacturing, the chief imports are usually cloth and clothing; machinery and other metal goods generally come next; while the other manufactures follow in varying order. Only in tropical regions where much of the food of the inhabitants is imported does the importance of the main articles greatly change.

The Problem of a White Australia. One of the great problems in Australia is the question whether or not the number of inhabitants of Australia can be greatly increased. There is a constant question whether white men can stand the high temperature of the tropical parts of the continent and the heat and glare of the desert areas. The white Australians probably stand the climate as well as the people of any part of the world, for the government pays much attention to the health of its subjects, and the death rate is low even in the north. Moreover, the tropical parts of Australia do not seem to be as unhealthful as the tropical parts of central Africa and the Amazon basin. Many Australians themselves feel that a large

be a white man's country. The white man can probably live there and prosper, but whether he can permanently maintain high standards is a question. Much of the wealth of Australia lies in the moist northern parts where sugar, tea, coffee, pineapples, oranges, bananas, and many other tropical products can be raised. To develop these northern regions requires labor; and the Australians are confronted by the question, How can that labor be procured?

Most of the Australians insist that their continent remain white. They do not want Chinese, or Hindus, or any other race from Asia or Africa. They are perhaps more intense in this feeling than the people of California and British Columbia. Yet they feel that they must have immigration and that something must be done to develop their vast areas of waste land. Many people believe that they are making a mistake in attempting to fill up their country so rapidly, but that is a debatable question. For the present, one of the main problems of Australia is to find out just how tropical climates influence the white man and how the harmful influences may be overcome.

EXERCISES AND PROBLEMS

1. Compare Australia and North Africa by preparing the following maps for each region: (*A*) topographic, showing mountains, rivers, deserts, lakes, cities, railways, etc., by conventional symbols, and altitude by colored shading; (*B*) temperature and winds, (*C*) rainfall, and (*D*) vegetation.

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CHAPTER XXXIV

LATIN AMERICA AND TROPICAL DEVELOPMENT

The Physical Advantages and Disadvantages of South America.—If luxuriance of vegetation determined progress, South America would be the most fortunate of the continents. Its good fortune would be shared by most of Central America, the West Indies, and Mexico as far north as the Tropic of Cancer. Nowhere in Latin America except among the lofty mountains and in the far south is the temperature too low for luxuriant vegetation. The arid areas are also relatively small. Aside from the desert of northern Mexico, which is far smaller than the corresponding deserts in the Sahara, Arabia, and Australia, the dry regions are largely confined to narrow belts west of the mountains in latitudes below 20° and to a somewhat broader strip in the Andes between 20° and 30° south latitude and to a similar strip east of the Andes south of latitude 30°.

Unfortunately, a climate that fosters abundant plant life is not necessarily good for man. In much of the tropical part of South America and to a considerable degree in the North American and West Indian parts of Latin America, the very luxuriance of the vegetation is a hindrance. It makes transportation extremely difficult; the rapid growth of wild plants makes it hard to keep the weeds from choking the crops; and the damp recesses of the forests provide shelter for myriads of mosquitoes and other noxious insects. Moreover, the climate itself in the greater part of Latin America makes the native population inefficient, and subjects people of European race to the risk of serious breakdown unless they frequently recuperate in more bracing regions. No other continent except Africa finds its climate so much of a hindrance as does South America.

The relief of Latin America, like the climate, has both disadvantages and advantages. On the west the unbroken ranges of the lofty Andes have the unfortunate effect of completely shutting out oceanic influences and isolating a narrow Pacific coastal strip from the rest of the continent. South of latitude 30° where the temperature is favorable, mountains cause aridity in a large section of Argentina which would be well watered if the wet west winds were not shut out by the Andes.

Moreover, southeastern Brazil, including the famous coffee region, is mountainous and difficult to cross, and so is much of Central America and Mexico. On the other hand, broad lowland plains border the Atlantic Ocean at the mouths of the Orinoco, Amazon, and La Plata rivers. Since these plains coalesce in the interior it would seem as if communication ought to be easy all the way from Venezuela to Patagonia. Such is the case along the water courses, for the Amazon permits seagoing commerce to reach Manaos, or even Iquitos nearly 2000 miles up stream, and gives a good waterway to the very foot of the Andes. The La Plata and Orinoco likewise provide valuable waterways. If all the rivers in the plains of South America were deepened and straightened and supplemented by canals the continent would have a wonderful system of inland waterways. Elsewhere, however, the luxuriance of vegetation often makes travel as difficult as among high mountains.

In soil and mineral resources Latin America is much like Africa. The soil is wonderfully rich where the climate is dry, but may be leached and deficient in soluble plant food where the rainfall is abundant. Mineral wealth is not abundant as a rule, although the dry regions of Mexico, Peru, and Chile are rich. No great supplies of iron have been developed although fine ore is known. Coal is scarce, the total production from Mexico to Cape Horn being less than 3 million tons per year, or scarcely as much as that of Maryland. Most of this small amount comes from Chile, Peru, Brazil, and northern Mexico. The petroleum in Mexico is the only known supply of fuel on a large scale. But that lies close to the United States border and benefits this country and England vastly more than it benefits Latin America. Nevertheless, Latin America is probably no worse off in soil, minerals, or climate than are other parts of the world in corresponding latitudes, while the southern section including Argentina, Chile, Uruguay, and part of Brazil has important advantages.

The People of Latin America.—As soon as one crosses the Rio Grande or the strait between Florida and Cuba one is conscious of a great change not only in language and government, but in habits, modes of life, and methods of business. This change is much like that experienced in going from the northern to the southern side of the Mediterranean. So far as business is concerned some of the more noteworthy characteristics may be summed up as follows: (1) less energy and push than among the typical business people of the United States; (2) greater courtesy, willingness to wait or be discommoded for the sake of others, more sensitiveness to little personal deeds of thoughtfulness or thoughtlessness; (3) less respect for contracts and especially for apparent promises made in conversation. This last arises largely

from the fact that Latin Americans are usually so polite that they do not like to contradict, and often seem to assent or to make promises as a matter of courtesy, expecting that the other person will understand. (4) Almost everything in Latin America moves slowly, and the payment of bills follows this rule. The Latin American allows others to be slow in paying him, and expects to be allowed plenty of time himself. If this is once understood, it makes business far easier. (5) Graft is generally supposed to be even more common in Latin America than in the United States, and it is more or less recognized as legitimate. The officials are especially prone to graft, partly because they are so poorly and often so irregularly paid. (6) Unwillingness to abide by the will of the majority, which leads to frequent revolutions and makes it difficult to organize large business enterprises. (7) A relatively superficial education. Few business men in Latin America have had a college education, and specialists and experts are rare. (8) Lack of self-control. This is due largely to lack of physical vigor. It leads to a good deal of excited talk and gesticulations which have little importance when once the northerner learns to understand them and be patient with them.

These characteristics are by no means equally strong in all parts of Latin America, nor do they pertain to all classes. They belong primarily to the people of Spanish, or in Brazil, of Portuguese extraction, often with a certain amount of Indian blood, whose ancestors have been in America for some generations. They are most strongly developed in the equatorial countries. In Chile, Argentina, and Uruguay they largely disappear or at least are much modified. In those countries the immigration of Italians and Spaniards by the hundred thousand, and of other Europeans in smaller numbers gives a different aspect to the population, even though the old Chilean stock is about half Indian and half white.

A true knowledge of a country demands good understanding not only of the business men whom we have just considered, but of the laboring classes and farmers. In all the mountainous countries from Mexico to Peru and Bolivia the lower classes are largely Indians with more or less mixture of Spanish blood. In spite of marked differences, their outstanding traits are a sort of dull, slow stolidity which makes it very hard to arouse their interest or enthusiasm or to get them to work or to do anything in any way except the slow and often clumsy fashion of their forefathers. In the West Indies and along the eastern coast to Brazil, most of the lower classes are either Negroes or mixtures of the Negroes with Indians and Spanish. The Negro types are much less stolid than the Indians, more merry and responsive, and pleasanter to deal with, but they do not work hard, and tend to loaf and enjoy life

unless the mere needs of existence force them to work. In the southern countries, however, including southern Brazil, the farmers, cattle raisers, and laborers are largely of Spanish, Portuguese, and Italian origin, and are much better workers than either the Indians or Negroes. In the center of South America from southern Venezuela to Paraguay, the inhabitants are largely wild tribes of Indians who know no Spanish or Portuguese, and who live by the most primitive type of agriculture and by hunting and fishing.

The Types of Business in South America.—As one goes from south to north in Latin America, the character of the business activities changes notably, as may be seen in the accompanying table of exports. Argentina, with its exports of cereals and other agricultural products worth 319 million dollars in 1923, and of animal products worth 237 million dollars, ranks among the greatest of the world's food-supplying countries. The fact that it can raise such vast quantities of wheat, barley, corn, and vegetables and an enormous number of horses, cattle, and sheep shows that its people are active. They have not yet reached the point, however, where they seek to raise raw materials for their own use in manufacturing. They raise enormous quantities of flax for example, but only for seed, not fiber. Argentina's mineral resources are only moderate so far as yet discovered, and its forests are largely of poor bushy types. Some manufacturing of a simple kind such as meat packing has begun, but progress along this line is by no means so great as in Australia and New Zealand. Nevertheless, the prospects for a satis-

APPROXIMATE EXPORTS FROM SELECTED PARTS OF LATIN AMERICA

(In millions of dollars)

	Argentina, 1923	Uruguay, 1924	Chile, 1923	Brazil, 1923	Ecuador and Peru, 1919	Venezuela and Colombia, 1923	Honduras, Salvador, Guatemala, Nicaragua, 1919	Cuba	Mexico,* 1919
1. Cereals and vegetables	319	9	6	9	...	...	...	...	...
2. Plantation food products (coffee, tea, sugar, cocoa, bananas)	...	...	...	259	45	64	45	376	21
3. Leaves and fibers (cotton, tobacco)	...	...	...	6	27	...	...	25	41
4. Animal products	237	67	7	24	7	5	3	1	10
5. Forest products (including rubber)	13	...	...	8	...	...	4	....	1
6. Mineral products	...	...	164	...	28	13	...	2	107

* Exact division of Mexican products uncertain.

factory all-round development are excellent. The fact that Argentina will probably long continue to be a great exporter of staple food products is important for the United States, for with our rapid growth in manufacturing the time may not be far distant when the eastern states will import large quantities of food by sea.

In Uruguay the 67 million dollars' worth of exports of animal products against only 9 million dollars' worth of cereals and a negligible quantity of other products indicate an extraordinary reliance on a single resource. Only in recent years have the Uruguayans raised enough food to supply their own wants. Their economic condition suggests that of the Boers on the plateau of South Africa in about the same latitude, or of the cattle men in northern Mexico, but the abundant rain and fine pasturage even in the drier seasons give Uruguay a great advantage. So, too, does the fact that Uruguay, as well as Argentina and Chile, contains only a few Indians and is now receiving a large immigration of Italians, Spanish, and other Europeans.

In Chile the table shows a condition which we frequently find repeated in countries having large dry areas, namely a great development of minerals. Nitrate of soda is not only Chile's most important article of export, but the chief source of government revenue. In copper production Chile stands next after the United States. Animal products and cereals are the only other types of exports that are of appreciable importance, as happens in most countries with the Mediterranean type of winter rains and summer droughts. South of the regions where most of the Chileans now live there are extensive forests in a climate with abundant and in many cases excessive rain at all seasons. In fact in latitudes above 40° the heavy rainfall and low summer temperature, due to the winds from the Pacific, make it improbable that a large agricultural population can ever find a living. Across the mountains in the Patagonian part of Argentina, although the summer temperature as far south as latitude 45° is high enough for profitable agriculture, the scanty rainfall due to the cutting off of the west winds by the Andes interposes another barrier to progress. Thus the part of South America south of 40°, corresponding to the parts of North America and Europe where business is most active, is scantily populated and little developed, while the region from 30° to 40° S. is the seat of the greatest activity.

Now contrast Brazil with the three southern countries of South America. A great change is apparent, corresponding to the more tropical character of the climate. Cereals and vegetables drop out of the list of exports, as do minerals. Animals, though still important, hold no such place as in Uruguay and Argentina in proportion to the popula-

tion. On the other hand, food products derived from tropical plantations become enormously important. About $217,000,000 of the $259,000,000 in this part of the table of exports must be ascribed to coffee alone, with smaller amounts for sugar, cocoa, and yerbe maté. Leaves and fibers, chiefly tobacco and cotton, also become prominent. In Brazil there is likewise a moderate amount of India rubber, which is here a forest product, although in the East Indies it is a plantation crop which might be placed with cotton and tobacco.

In the Andean countries of Ecuador and Peru, just as in Brazil, the effect of the tropical climate is evident in the plantation food products, chiefly cocoa in Ecuador and sugar in Peru, and in the leaves and fibers, which here mean chiefly Peruvian cotton. All the main exports of vegetable products from the Andean countries come from their warm lower portions. Only in the exports of minerals, which are chiefly the petroleum, copper, and silver of Peru, do we see the effect of the mountains. These countries, like practically all others, have many minor exports, but here we are considering only the main articles which are produced in sufficient surplus to be important for world commerce.

Passing on to the northern countries of South America, the table shows that in Venezuela and Colombia plantation food products assume almost as preponderating a place as do animals in Uruguay. Coffee is by far the chief export ($55,000,000 in 1923), with cocoa coming second in this group and bananas third. In the small Central American countries the same conditions are still more marked. Finally in the islands of Cuba and Jamaica the plantation system reaches its highest development, for there the exports are practically all plantation products, either foodstuffs among which sugar is far and away the most important, or tobacco. The high development of plantations in the northern parts of Latin America is due partly to the tropical climate and partly to the fact that this region is near the densely populated parts of the United States where the demand for such products is great. In Mexico plantation products still play an important part, for in 1919 sisal fiber accounted for about $40,000,000 among the group called "leaves and fibers," while sugar figures among the exported food products. Minerals, however, rise to great importance just as they do far to the south in Peru and Chile. Petroleum accounts for about half the mineral exports of Mexico, but most of the other important minerals aside from coal and iron are well represented.

The Contrasted Imports of North and South.—In the matter of imports the countries of Latin America show the same marked contrast as in exports. This is evident in the following table, which shows the approximate annual imports per capita:

	Argentina and Chile, 1923	Cuba, 1923
Clothing materials and shoes	$18.00	$18.40
Machinery, metal manufactures, etc.	15.70	22.00
Foodstuffs (not including narcotics)	2.70	34.00

The people of Argentina and Chile import large amounts of clothing, about $90 worth per family, for they are comparatively well to do, but have few factories. The Cubans, being also prosperous because of the sugar industry, import practically the same amount. On the other hand, the farmers and cattle raisers of the southern countries do not need so much machinery and metal wares as do the sugar planters of the northern islands with their mills, tramways, and other appliances. When it comes to food, the people of the far south are practically self-supporting. The islanders, on the contrary, are so busy producing sugar, tobacco, and cocoa that they import more than 12 times as much food per person as do the Argentinians and Chileans, or about $170 worth per family. In other words, the people of the southern countries of South America display a healthy economic system in which they feed themselves, send staple food supplies to other countries, develop simple manufactures, and run their own business in such a way that gradually they are likely to become more and more independent of other countries. As one comes north in Latin America, however, the plantation system becomes more and more firmly established. The people do not raise enough food for themselves; they largely produce luxuries or products of secondary importance rather than necessities; they depend on outsiders for guidance and capital in their simple manufacturing; and their dependence on other countries becomes steadily greater.

The Distribution of the Tropical Commerce of the United States.—The importance of the trade between tropical countries and those of higher latitudes is steadily growing. This is natural in view of the differences in the products of the two regions and the increasing demand of prosperous manufacturing regions for raw materials and luxuries from warm countries. The way in which the tropical trade of the United States is distributed among the various continents and the extent to which it increased from 1913 to 1923 appears in the table on page 498.

In 1913–14, during the last normal year before the war, the United States sent $22,200,000 worth of goods to tropical Africa, nine-tenths of 1 per cent of our total exports. In 1923, when conditions were settling back to normal but were still a good deal disturbed, this country sent

only $12,200,000 worth of goods to tropical Africa, an amount which was scarcely a third as great a percentage of the total as in 1913–14. If Europe had been in a normal condition in 1923 and had been able to buy as much as usual, Africa's percentage might have been even less. Obviously, our exports to Africa are relatively falling off. On the other hand, the imports of tropical products from Africa rose from $4,300,000 to $15,200,000, but even in 1923 amounted to only 0.4 per cent of the total, so that the trade of the United States with tropical Africa is almost negligible. In Col. I and J, imports and exports have been added together, while the last column shows the percentage by which the actual value of the total trade with the United States increased from 1913 to 1923. Since prices in 1923 were more than 60 per cent higher than before the war, an increase of 3 per cent in Col. K really means a large decrease in the total trade of the United States with tropical Africa in 1923.

EXPORTS AND IMPORTS OF THE UNITED STATES FROM TROPICAL COUNTRIES

Tropical Regions of	Exports				Imports				Exports and Imports		
	A	B	C	D	E	F	G	H	I	J	K
	1913–14		1923		1913–14		1923		1913–14	1923	
	Millions of Dollars	Per Cent of U. S. Total	Millions of Dollars	Per Cent of U. S. Total	Millions of Dollars	Per Cent of U. S. Total	Millions of Dollars	Per Cent of U. S. Total	Millions of Dollars	Millions of Dollars	Per Cent of Increase
Africa	22.2	0.9	12.2	0.3	4.3	0.2	15.2	0.4	26.5	27.4	3
South America	56.3	2.3	103.0	2.5	142.4	7.2	237.3	6.3	198.7	340.6	71
Asia	135.7	5.5	105.5	2.6	47.6	2.3	236.1	6.2	183.3	341.6	86
North America and W. Indies	210.7	8.6	464.0	11.3	299.7	14.9	685.8	18.1	510.4	1149.8	125
All continents	424.9	17.3	684.7	17.7	494.0	24.6	1174.4	31.0	928.9	1859.4	100

Applying the same kind of reasoning to tropical South America, it appears that on a percentage basis the exports of the United States to the part of South America north of Chile, Argentina, and Uruguay increased very slightly from 1913 to 1923, but imports from these regions showed a relative decline from 7.2 per cent to 6.3. The net result was that the total volume of business (both exports and imports), between the United States and the tropical part of South America remained nearly steady, for the increase in prices accounts for much of the seeming gain of 71 per cent.

The high figures for the business of the United States with the tropical parts of Asia and North America indicate that southeastern Asia and the East Indies on the one hand, and Mexico, Central America, and the West Indies on the other hand, are the great sources of tropical products for the United States. They are likewise the chief sources for Europe. Moreover, there was a real increase in the trade of the United States with these two regions, as is indicated by the large percentages in the last column. If we exclude from the North American figures an increase of about 70 million dollars in the importation of petroleum from Mexico, on the ground that petroleum is not in any special sense a tropical product, the figure for North America in Col. K becomes 112.

In 1923 the wholesale price index of the United States for all commodities stood at 154 according to the Federal Reserve Board, the figure for 1913 being 100 and for 1914 only 97. On this basis the tropical trade of the United States with the various continents suffered the following percentages of increase or decrease:

Africa	34 per cent decrease
South America	10 per cent increase
Asia	19 per cent increase
North America and West Indies	44 per cent increase

Why Commerce with South America Increases more Slowly than with Tropical Asia.—The figures given in the preceding table show that while in 1913–14 the total trade of the United States with tropical South America ($198,700,000) exceeded that with tropical Asia ($183,300,000), in 1921 the figures had been reversed ($299,400,000 for South America against $379,600,000 for Asia). In view of the relative nearness of tropical South America to the United States and the constant attempts during the last few decades to stimulate South American trade, these facts present one of the most important business problems for both the United States and South America. A study of the relative importance of the tropical products imported into the United States in 1913 and 1920 will help in understanding this.

Among these products sugar and molasses are already so widely used that a rapid increase in production is not needed. The increase of 44 per cent in imports from 1913 to 1920 was largely due to the disturbances of the Great War which caused this country to refine sugar for countries that formerly bought from Central Europe. The growth in the demands of the United State can be supplied with comparative ease by opening new plantations in Cuba and the other parts of the West Indies and Central America where the industry is already well established, and

where there is a fairly large labor supply. The demand for coffee, the main tropical import from South America, increased rapidly perhaps because of prohibition, but it is doubtful whether this will continue. On the other hand, the increased use of automobiles and the utilization of rubber in many other industries is causing the demand for rubber to increase enormously in spite of fluctuations from year to year. Formerly nearly half the world's rubber came from Brazil, but most of it was from wild trees. To supply the present demand huge plantations are needed, and these have been established in the East Indies not only because the climate is favorable but because of the large supply of fairly good labor. Moreover, trade follows the flag, and European flags fly all over southern Asia and the East Indies.

CHIEF TROPICAL PRODUCTS IMPORTED INTO THE UNITED STATES

Article of Import	Value (1913) per Statistical Abstract	Approximate Amount, 1920	Amount in 1920 Expressed in Percentage of 1913
(1) Sugar and molasses	$163,350,000	9,489,300,000 lb.	144
(2) Coffee	119,450,000	1,417,063,000 lb.	163
(3) India rubber	97,630,000	566,546,100 lb.	430
(4) Fibers (hemp, sisal, etc.)	45,170,000	771,072,000 lb.	104
(5) Vegetable oils	20,090,000	260,041,000 lb.	164
(6) Cocoa and chocolate	18,180,000	344,986,000 lb.	217
(7) Tea	17,430,000	90,247,000 lb.	101
(8) Fruit (bananas)	15,400,000	39,319,600 bun.	85
(9) Gums	15,170,000	142,341,000 lb.	155
(10) Cabinet wood	7,380,000	67,000 M ft.	74
(11) Spices	6,190,000	60,918,000 lb.	104
(12) Rice	6,100,000	142,951,000 lb.	57
(13) Nuts	5,000,000	299,907,000 lb.	667
(14) Dyewoods	2,900,000	269,000,000 lb.	149
(15) Ivory	2,800,000	667,500 lb.	93
(16) Sago, tapioca	1,190,000	.....	...
(17) Indigo	1,100,000	919,000 lb.	11
(18) Quinine (bark)	360,000	4,067,000 lb.	145
Total	$544,890,000		

The need of the United States for fibers such as hemp and sisal for use in making rope and twine has increased scarcely more rapidly

than the population during the past twenty years. The same is true of the demand for tea and spices, while the demand for bananas, rice, and indigo has actually diminished. Certain other products including cabinet woods and ivory are imported in smaller quantities than formerly because the easily available supply is depleted. The tropical articles for which the demand is increasing—and will apparently continue to increase significantly—are rubber, vegetable oils made largely from palm nuts, cocoa and chocolate, gums, nuts (especially coconuts), dyewoods, and quinine. South America might supply all of these, but they demand steady plantation labor. South America has a labor supply which is both poor and scanty. The Indians, as we have seen, are not good workers. The Negroes and the mestizos, or mixed Spanish and Indian stock, are generally considered more competent but cannot be relied upon. They work to-day and loaf to-morrow, which is one reason why tropical Africa and South America play so small a part in the world's business. The best tropical labor in the world appears to be that of the rice-raising and millet-raising people of southeastern Asia and the East Indies,—the Hindus, Chinese, Malays, Javanese, and others. The 20,000 Hindus brought by the British to Jamaica and the 130,000 in British Guiana are among the reasons why the production of those regions is relatively large. The Asiatics and East Indians are perhaps not so efficient man for man as the Negroes and Latin Americans, but they are more docile, easier to handle, and as the result of living for generations in regions of dense population are much more steadily industrious. Since southeastern Asia contains a vast reservoir of relatively reliable tropical labor while South America contains a much smaller supply of less reliable labor, South America is at a disadvantage for all plantation products which can stand long transportation. In the old days when it was a question of finding wild rubber, wild gums, wild quinine, the Indian was as good as the Hindu, but now when transportation is cheap and plantations are the order of the day, the Hindu, Chinese, and East Indian labor supply is a great asset. Thus the supply of plantation products for the United States tends to come more and more either from southeastern Asia because of the labor supply, or from Central America and the West Indies because of nearness plus a labor supply poorer than that of Asia, but better than that of tropical South America.

EXERCISES AND PROBLEMS

1. On a map of Latin America outline areas of (*A*) tropical forests; (*B*) semi-arid grasslands; (*C*) deserts; and (*D*) great altitudes; shade the remaining area. How does this area compare with corresponding areas on similar maps of the United States, Europe, and Africa?

2. The relative scarcity of population in South America. List all the countries of the world which have a population (*A*) more than that of all South America, (*B*) half as large. How does the density of population in these countries compare with that of South America?

On a map of South America shade lightly the countries having a density of less than 10 per square mile, and heavily those with a density of 10 to 17. (Table 1 C.) Do the same for the United States (Table 2 C), Europe, and Africa (Table 1 C), and draw comparisons. Explain the causes of the sparsity of population in South America. What effect has density of population on business? How is the sparsity of population in South America evident in Table 4?

3. As a source of agricultural products, how does South America compare with the United States? Use Tables 1 B and 2 B as a basis for deciding how the production of South America would compare with that of the United States if the efficiency per farmer were the same.

Suppose that the number of farmers in the United States is 50 per cent larger than in South America. Then in Table 11 A, if the production per farmer in the United States were the same as in South America, the production of the United States according to the ratio of the number of farmers would be about 273 million bushels, but actually the ratio is 10 times as much. Find a similar ratio for each crop, and also for the animals of Table 14. In what sort of farm products does South America fall far behind the United States? In what is its production per farmer about like ours, and in what does it far excel? Explain the causes of this.

4. Discuss the products named in this chapter which South America produces abundantly and the United States not at all or in insignificant amounts. Explain their climatic optima, their mode of production, and the economic or other conditions which help to cause them to occupy a different place in the United States and South America.

5. On a map of Latin America draw heavy vertical lines proportional to the production of each country in vegetable food products, lumber, minerals, and animal products, or if desired, use the classification in the table in this chapter. It may be necessary to translate the items of the tables into the same units (the value). How does your map compare with a similar map of Africa or the United States? Consider the possible future development of the Latin-American areas, in view of the physical features and present products.

6. What justification is there for the widespread idea that South America is rich in minerals? From Table 25 make a list of the minerals produced in South America in amounts corresponding to the following percentages of the production of the United States: (*A*) over 100 per cent; (*B*) 50–100 per cent; (*C*) 10–50 per cent; (*D*) 1–10 per cent; (*E*) not at all. Find how far the low figures in South America indicate lack of resources and how far lack of exploitation. The *Atlas of Commercial Geology* published by the U. S. Geological Survey will help you.

7. Get as much information as possible about the manufacturing of South America compared with that of the United States. Use the tables in this chapter and Table 30 at the back of the book. Try to classify the manufacturing industries of South America as given in ordinary books of reference according to whether they are primitive, simple, or complex. Where does each kind occur and to what extent?

8. Study the relative excellence of the systems of transportation and communication in the various countries of South America. Prepare an alphabetical list of the South American countries and make a table from the figures given in each of the following columns, 33 B, C, E, F, H, and 34 B and D. Prepare a second table of the

same kind, but instead of the figures from the tables in the book insert the rank of the different countries on a scale from 1 to 10, as can easily be done by study of your first table. Add the ranks of all columns for each country and put the sum or average in a final column. A low figure will mean that on the whole the system of transportation and communication is good. Use your results as the basis of an isopleth map. Interpret your map and its relation to business.

9. Compare the amount of foreign commerce in different parts of South America with the systems of transportation and communication. From Table 39 B and G combined draw an isopleth map of the per capita foreign commerce of South America. Do the same for the per capita commerce with the United States, Table 39 E and J. Compare these maps with one another and with the map of Exercise 5. How do you explain their resemblances and differences? Does active commerce cause the development of systems of transportation, or do transportation and communication systems cause commerce, or do other cause give rise to both? Discuss this whole question, and prepare a written report on it, illustrating your report with other maps not mentioned in this exercise.

10. Repeat Exercises 1 to 6, using Central America, the West Indies, and Mexico, instead of South America.

11. Make a study of an individual country, product, activity, or business opportunity in South America along the general lines of Exercises 5, 6, 7, and 8 in Chapter XXIX.

PART V

TABLES

SOURCES OF TABLES

(Note: Numbers following names indicate tables for which the various sources have been used, in whole or in part.)

1. American Telephone and Telegraph Company 37, 34
2. Annuaire Internationale de Statistique, 1917, 1920 ..... 7, 9
3. Automotive Industries, Feb. 26, 1925 ..... 34, 37
4. Canada Yearbook, 1922–23, and Census Reports 2, 3, 15, 16, 17, 18, 19, 20, 24, 27, 30, 27
5. Income in the Various States, National Bureau of Economic Research 45
6. International Yearbook of Agric. Statistics, 1923 ..... 9, 11, 12
7. Mineral Industry during 1923 26
8. President's Proclamation, June 30, 1924 1
9. Statesman's Year Book, 1924 ..... 1, 4, 5, 9, 40

United States Government:

10. Agriculture Yearbook, 1919 10
11. Agriculture Yearbook, 1920 ..... 10, 35, 36
12. Agriculture Yearbook, 1921 11
13. Agriculture Yearbook, 1923 24
14. Agriculture Yearbook, 1924 ... 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 45, 46, 49
15. Atlas of Commercial Geology 29
16. Birth, Still-Birth and Infant Mortality Statistics 46
17. Census Reports 2, 3, 6, 8, 10, 17, 20, 25, 28, 29, 30, 31, 32, 46, 47, 49
18. Commerce Yearbook 40
19. Commerce and Navigation 34, 38
20. Fisheries, Bureau of 22
21. Foreign Trade of the U. S., 1924 (Dept. of Commerce) 42, 43, 44
22. Geological Survey, Reports of 26, 27, 30
23. Mint, Report of the 26
24. Mortality Statistics, U. S. Census 46, 47
25. Retail Prices, Bureau of Labor 47
26. Statistical Abstract, 1922 34
27. Statistical Abstract, 1923 ..... 1, 22, 24, 25, 26, 27, 33, 37, 38, 39, 41, 46, 49
28. World Almanac, 1925 ..... 7, 9, 29
29. Zon and Sparhawk: Forest Resources of the World 23

Special attention is called to the fact that separate indexes to illustrations and tables precede the general index.

NOTE ON METHOD OF PREPARING TABLE A (THE WORLD'S CHIEF PRODUCTS) PAGE 9

A. General Method. In Table A, page 9, the units in Col. B are generally those employed in statistics published by the United States Government. They differ somewhat from those used in the world tables in the Appendix.

Col. C is based on one of the following: (*a*) Average farm price in U. S., first of each month, 1920–24, per *Agriculture Yearbook*, but in minor cases a smaller number of years, or only the census year, 1919; (*b*) for articles not produced in U. S.; average import price in New York, 1920–24. No allowance is made for freight and commissions, for practically all products of this kind are raised by cheap tropical or oriental labor; (*c*) the price of metals in U. S., 1919–3, is calculated from the tables in *Statistical Abstract of the United States.*

In Col. D data as to animals and plants are generally based on averages for 1921–4, as given by the United States Department of Agriculture, and the International Institute of Agriculture, supplemented by the U. S. Census, 1920, and Zon and Sparhawk's *Forest Resources of the World.* For minerals only a single year, generally 1923, is used, as found in *The Mineral Industry During 1923*, supplemented by reports of the United States Geological Survey. The original data for Col. D appear in Tables 11, 13, 22, 23, and 26 in the Appendix, but small amounts are often added for minor countries not there mentioned, and the data for China are only rough approximations.

B. Special Features. (Numbers refer to location in Table A.)
1. Rice. Average farm price, U. S., 1920–24, $1.11 per bushel (45 lbs.) of rough rice. One pound cleaned rice = 1.62 lbs. rough rice. Hence 1 lb. cleaned rice is worth at least 4.1 cents. Allowing 10 per cent for cleaning, this becomes 4.5 cents.

3. Hay and forage. Value of forage per acre reckoned at ratio borne by an acre of hay to an acre of forage, U. S., 1919.

5. Wood. Saw timber, firewood, and pulpwood reckoned separately according to values given in 1920 U. S. Census.

6. Garden vegetables. Reckoned by two methods giving approximately the same result: (1) Per U. S. Census, 1920, per capita production in Australia and Canada being reckoned at same value as U. S.; Europe 60 per cent. of U. S.; rest of world, 20 per cent. (2) *Foreign Crops and Markets*, April 30, 1924, gives acreage of onions in 18 countries.

Assuming that onions form same percentage of minor vegetables in whole world as in U. S., the total vegetable production of the 18 countries was estimated and a rough allowance made for other countries.

9. Grapes. Based on world total of wine per Int. Inst. Agr. 1923, and scattered data for grapes used fresh and for raisins.

11. Millet. Based on area under cultivation in British provinces of India per *Imperial Gazetteer of India*, with equal per capita allowance for native provinces. Average yield per acre about 650 lbs. Chinese production estimated as equal to that of India and that of rest of world as 75 per cent as much.

12 and 21. Beans and peas. Based on *1921 Yearbook*, U. S. Dept. Agr. and *Foreign Crops and Markets*, April 16, 1925. For China and Indo-China production is estimated at 200,000,000 bushels of beans, equal to crop in Japan, Chosen, and India, and 20,000,000 bushels of peas. Statistics for beans and peas are so unreliable that the U. S. Dept. Agr. has recently omitted them except for U. S.

17. Sweet potatoes and yams. *Foreign Crops and Markets*, June 11, 1924, gives approximate production for Japan, 172,000,000 bushels; Dutch East Indies, 367,000,000; U. S., 104,000,000; Mexico, Brazil, and South Africa, approximately 1,000,000 each; Australia, 500,000; China is assumed to produce as much as the countries mentioned above; and Indo-China, Siam, India, Africa, and South America aside from Brazil, as much more.

18. Apples. *Foreign Crops and Markets*, Dec. 10, 1924. Published data usually include only the commercial crop, but the crop for home consumption is generally about the same size. Data are available for only 11 countries which appear to produce 470,000,000 bushels out of an estimated 600,000,000.

20. Bananas. The U. S. averages about one banana per week per person. A bunch of bananas contains from 100 to 150 fruits. In many tropical countries almost every family has a banana grove and several bananas per day are eaten by almost everyone. Other tropical people have no bananas. It is impossible to estimate how many belong in each group. The total number of tropical people is roughly 470,000,000. The figure given in the table is based on the assumption that, on an average, tropical people consume seven times as many bananas per capita as those of the U. S. This assumption is little more than a guess. Average import price of bananas in New York, 1921–23, $.45 per bunch.

21. Peas. *See* 12.

22. Tea. Half the world's production is estimated for China.

23. Olives. Price as in Spain for 1920–23, plus one-third, or approximately the import price at New York.

24. Berries. Commercial crop in 1919 in U. S., per 1920 Census, was valued at about $60,000,000. $90,000,000 is added for home and wild crops. Europe, aside from old Russia, the Balkans, Italy, Hungary, and Spain, is reckoned at the same per capita production as U. S. For rest of world an arbitrary allowance of about $100,000,000 is made.

26. Peanuts. *Foreign Crops and Markets*, April 5, 1925, and *Oleaginous Products and Vegetable Oils* (Int. Inst. Agr.)

28. Citrus fruits. *Foreign Crops and Markets*, Nov. 19, 1924.

30. Coconuts and palm oil. *Oleaginous Products and Vegetable Oils* (Int. Inst. Agr.). Zon and Sparhawk in *Forest Resources of the World* estimate that there are 240,000,000 coconut trees in Asia, Oceania, and America which yield 7 to 8 billion nuts per year. In *Foreign Crops and Markets*, April 6, 1925, the average number of coconuts per tree in the Philippines, 1909–1913, is given as 23. Average value of nuts is based on import price in New York and local price where coconuts are raised in Florida. Data for palm oil are based on an estimated production of 400,000 long tons in 1919 (Int. Inst. Agr.), with allowance for some production not exported.

33. Milk. Fairly full data for 21 countries in *Milk and Milk Products* (Int. Inst. Agr.) give 31,420,000,000 gallons as the production of 240,000,000 cattle. The 357,000,000 cattle in other countries are estimated as producing only 15 per cent as much milk per head as do the others. Allowance is also made for milk of sheep and goats.

34. Cattle. The world total for cattle is fairly well known, although estimates must be relied on for China, etc. For 14 main countries given in *Int. Yrbk. Agr. Statistics*, the calves under one year of age number 21.4 per cent of the total cattle. Many calves, however, are killed before reaching one year of age. In the U. S. the cattle slaughtered from 1921–23 amounted to approximately 28 per cent of the average number of living cattle on the first of the years in question. Twenty-five per cent is assumed as the average annual production of calves that live to maturity.

Average price in the U. S., 1921–25: milch cows, $60.81; other cattle, $29.80; all cattle, $42.00. This last price is used for U. S., Canada, South Africa, and New Zealand, where the proportion of milch cows is about as in the U. S. For Europe, where the percentage of milch cows runs higher, a price of $46.00 is used. For the rest of the world, where the percentage of milch cows is small and the majority of animals are kept for work or for beef, $36.00 is used.

35. Swine. In the U. S. from 1921–23 the approximate number slaughtered under Federal supervision, under other supervision, and with an allowance of 2 per cent for unregulated slaughtering, was approx-

imately 110 per cent of the number of animals living on the first of each year. This ratio is used for all countries.

36. Sheep and goats. In most countries data for sheep and goats are separated. Where they are not separated, the figures for a few countries have been divided in proportion to the ratio of sheep and goats in all countries. According to the average for 12 countries (*Int. Yrbk. Agr. Stat.*), the lambs under one year of age number 35 per cent of the total sheep, but many lambs are killed before reaching one year of age. In the U. S. the sheep and goats slaughtered from 1921–23 appear to have numbered approximately 42 per cent of the total. This figure is used in calculating the yearly production of the flocks.

37. Eggs. The production of eggs per fowl per year from 1921–23 in the U. S. is estimated by the Department of Agriculture as about 4.6 dozen. Since many countries fall below this, the average for the world is assumed to be 4 dozen per year.

38. Poultry. For countries for which no data are available the poultry are roughly estimated as being $\frac{1}{2}$, $\frac{1}{10}$, etc., as numerous as the inhabitants, according to the fractions in Col. Table 13, in Part V. These estimates are little more than guesses, but are inserted to obtain a general idea as to the world importance of poultry compared with other animals. Since the total of these estimates amounts to only 16 per cent of the world total any errors which they contain do not affect the general magnitude of the values for poultry and eggs. All data for poultry include ducks and geese as well as hens.

39. Fish. Based on data issued by U. S. Bureau of Fisheries, Feb., 1925. The difficulty of using these data may be judged from the fact that the value per pound in Germany in 1919 is given as 1.4 cents and in Denmark, 1922, as 10.0 cents. Again, the fish caught in China, Chosen, and certain unnamed Asiatic countries are valued at $34,000,000, but the Japanese catch is put at $89,000,000. The Japanese price per pound (3.6 cents) is approximately the same as that in the U. S. (3.2 cents). If the data for China included not only the recorded commercial catch, but the vast number of fish caught locally, both in the ocean and in the streams and ponds, it seems as if the Chinese value must at least rise well toward twice that of Japan. Hence the Chinese value is given as $150,000,000, the other data being as in the table of the Bureau of Fisheries.

41. Horses. In 7 countries for which data are given in *Int. Yrbk. Afr. Stat.*, the colts under one year form 7.25 per cent of the total number of horses. This figure is taken as the annual increase for horses, mules, and asses in calculating Table A. Values are estimated at the U. S. census ratios in 1920 (horses, $91.00; mules, $145.00; asses, $11.40).

In China it has been assumed that a million of the animals recorded as horses, and a million recorded as asses, are mules. Where mules and asses are given together, it has been assumed that one-third are mules. The value of all the horses, mules, and asses in the world at the rates here given amounts to over $11,000,000, compared with $23,000,000 for cattle, $3,500,000 for the swine, and $4,500,000 for sheep and goats.

42. Hides. The annual number of hides is assumed to be the same as that of young animals. The wholesale value of hides and the percentage of different kinds purchased by the boot and shoe industry in the U. S. were as follows, according to the Census of 1919:

	Percentage	Value
Cattle hides	18	$13.80
Horse hides	2	4.33
Calf and kid hides	10.5	5.78
Goat skins (chiefly imported)	45	1.49
Sheep and lamb skins	18.5	1.20
Other skins	6	1.21

The farm price, 1920–24, has been arbitrarily assumed to average one-third of the prices given above. On the basis of slaughter-house records, calves have been reckoned as forming one-third of the total number of cattle slaughtered. No allowance is made for animals that die and are not skinned. Pig skins are not included, because of their slight value. At 10 cents apiece, if all were used, which is by no means the case, they would be worth $20,000,000.

43. Raw silk. Data are available for production in Mediterranean lands and for exports in the Far East. Ten per cent is added to the Far Eastern exports to represent local consumption. This gives China far less than the huge figure given by the *Int. Yrbk. Agr. Stat.* and given in reduced form in Table 11. The price given in Table A includes not only raising the silk, but winding it into filatures and transporting it to New York. Even so, it is presumably lower than would be possible if the silk were raised in the U. S.

All Metals.—The figures for the metals represent amounts and values after the ores have been smelted and otherwise treated to separate the metal from the ore. This is really a manufacturing process. The work of separating the metals from the ores is in several ways like the threshing of grain and the curing of hay, that is, it is a necessary preliminary to any use of the product. It is, however, far more expensive. In the case of iron, for example, the value of the ore at the mine in 1923 was $240,739,000, whereas the value of the pig iron smelted in the United States, which represents practically the same ore, was $935,909,000. The values of the metals in Table A are based on the data given in the Appendix and derived from the U. S. Geological Survey and *The Mineral Industry in 1923.*

TABLE 1—WORLD: AREA, POPULATION, GOVERNMENT, MONEY AND IMMIGRATION

Continent and Country	A Area (Thousands of Square Miles)	B Population (Thousands) (1923 or Nearest Available Date)	C Population per Square Mile	D Government	E Monetary Unit	F United States Equivalent at Par	G Gold and Silver per Capita, 1922	H Paper Money per Capita, 1922	I United States Immigration Quota, 1925–6	J Immigrants Admissible per Million Population
AFRICA:										
Abyssinia (Ethiopia)	350.0	10,000	29	Independent Empire	Thalari	[1]	$0.04	$0.04	100	10
Algeria	222.1	5,806	26	French colony	Franc	.193	.....	130.25		
Angola	484.8	4,119	9	Portuguese colony	Escudo	1.0805	.....	1.99		
Belgian Congo	913.1	15,000	16	Belgian colony	Franc	.193	.26	2.12		
British East Africa [3]	720.2	9,869	14	British colony	Shilling	.2433				
British South West Africa	322.4	237	0.7	S. African mandate	.....	.....	.....	.....	100	420
British West Africa [5]	481.8	22,828	47	British colony	Pound	4.8665				
Cameroon (France)	166.5	1,500	9	French mandate	Franc	.193	.....	.....	100	
Egypt (Nile Valley)	12.2	13,451	1100	Independent kingdom	Pound	4.9431	2.92	2.61	100	7
(Desert Areas)	335.6	100	0.3							
Eritrea	45.9	450	10	Italian colony	Lira	.193	5.32	55.98		
French Equatorial Africa	982.1	2,846	3	French colony	Franc	.193	.....	.48		
French West Africa	1800.6	12,284	7	French colony	Franc	.193	.....	16.63		
Guinea (Portuguese)	13.9	289	21	Portuguese colony	Escudo	1.0805				
(Spanish)	9.5	200	21	Spanish colony	Peseto	.193				
Liberia	36.8	1,500	41	Independent republic	U. S. Dollar and £ sterling	.....	.....	.....	100	67
Libia (Tripoli and Cyrenaica)	406.0	1,000	2	Italian colony	Lira	.193				
Madagascar	228.0	3,513	15	French colony	Franc	.193	3.14	29.51		
Mauritius	0.8	376	470	British colony	Rupee	.3244				
Morocco	221.2	6,000	27	French protectorate	Franc	.193	.....	40.15	100	17
Mozambique	426.7	3,120	7	Portuguese colony	Escudo	1.0805	.48	45.51		
Nyasaland	39.6	1,200	30	British colony	Pound	4.8665	.94			
Rhodesia, etc. [4]	733.4	2,524	3	British colony	Pound	4.8665	.56	5.36		
Sahara	1544.0	800	0.5	French colony						
Somaliland (British)	68.0	300	4	British colony	Rupee	.3244	.54	.55		
(French)	5.8	208	36	French colony	Franc	.193	.....	12.14		
(Italian)	139.4	650	5	Italian colony	Rupee	.3244	2.26			
Sudan (British)	1014.0	5,850	6	British colony						

Tunisia	48.3	2,094	43	French colony	Franc	.193	2.01	89.54		
Union of South Africa	473.1	6,929	15	British dominion	Pound	4.8665	12.64	3 03	100	14
ASIA:										
Aden	9.0	55	6	British colony	Pound	4.8665				
Afghanistan	245.0	6,381	26	Independent kingdom	Kabuli Rupee	.365	.....	.....	100*	16*
Arabia	1000.0	5,000	5	Independent states	No unit	.....	.....	.....	100	20
Armenia	15.2	1,214	80	Soviet republic	Ruble	.5146	.....	.....	124	102
Baluchistan	134.6	800	6	Indian dependency	Rupee	.3244				
Bhutan	20.0	250	13	Independent kingdom	.....	.....	.....	.....	100*	400*
Bokhara	79.4	3,000	38	Soviet republic	Rupee	.5146				
Borneo (entire)	285.8	2,483	9	Dutch and British						
(British, except Sarawak)	31.1	258	8	British colony	Dollar	.5678	.....	9.75		
(Dutch)	212.7	1,625	8	Dutch colony	Guilder	.402				
Burma	230.8	13,206	57	Indian dependency	Rupee	.3244				
Celebes	72.0	3,089	43	Dutch colony	Guilder	.402				
Ceylon	25.5	4,504	177	British colony	Rupee	.3244	1.79	8.72		
China, proper	1532.0	436,000	286	Independent republic	Dollar	[1]	.21	.45	100*	0.2*
Chosen	84.1	17,264	205	Japanese dependency	Yen	.4985				
Cyprus	3.6	311	86	British colony	Pound	4.8665	3.19	1.66		
Dutch East Indies	732.3	47,204	64[2]	Dutch colony	Guilder	.402	4.87			
Formosa	13.8	3,655	264	Japanese colony	Yen	.4985				
Hong Kong	0.4	625	1560	British colony	Mexican dollar	.50+				
India (total)	1829.8	324,360	178	British dependency	Rupee	.4866	.....	.....	100*	0.3*
(British)	1093.1	247,138	220	British dependency	Rupee	.4866	1.72			
(French)	0.2	265	1325	French colony						
(Native States)	709.6	71,937	101	British dependencies	Rupee	.4866				
(Portuguese)	1.5	516	34	Portuguese colonies						
Indo-China (French)	274.5	18,982	69	French colony	Piaster	[1]	1.00			
Japan, proper	148.8	57,656	387	Independent empire	Yen	.4985	.....	.....	100*	1.7*
Java and Madura	50.6	35,017	692	Dutch colony	Guilder	.402				
Khiva	24.3	519	21	Soviet republic	Ruble	.4866				
Khirghiz Steppes	835.2	5,059	6	Soviet republic	Ruble	.5146				
Malay States	51.0	2,449	48	British colony	Dollar	.5678				
Manchuria	363.6	12,740	35	Part of China	Dollar (one yen)	[1]	.....	.....		
Mesopotamia (Iraq)	143.3	2,849	20	British mandate	.....	.....	.....	.....	100	35
Mongolia	1367.6	645	0.5	Independent republic	Ruble	.5146				

* Available only to persons eligible to citizenship in the United States and admissible under immigration laws. Practically free immigration is allowed from all American countries.

[1] Fluctuates with the price of silver.

[2] Omitting Java and Madura, the population per square mile for the Dutch East Indies is 18.

[3] For the purposes of this book, British East Africa is held to include Kenya, Uganda, Zanzibar, and Tanganyika (mandate).

[4] For purposes of this book, Swaziland, Basutoland, and Bechuanaland are included with Rhodesia.

[5] For purposes of this book, British West Africa is held to include Nigeria, Gambia, Gold Coast, Sierra Leone, Togoland (mandate), and Cameroon (mandate).

TABLE 1—WORLD: AREA, POPULATION, GOVERNMENT, MONEY AND IMMIGRATION—*Continued*

Continent and Country	A Area (Thousands of Square Miles)	B Population (Thousands) (1923 or Nearest Available Date)	C Population per Square Mile	D Government	E Monetary Unit	F United States Equivalent at Par	G Gold and Silver per Capita, 1922	H Paper Money per Capita, 1922	I United States Immigration Quota, 1925–6	J Immigrants Admissible per Million Population
ASIA—*Continued.*										
Nepal	54.0	5,600	10	Independent kingdom	Mohar	.203			100*	18*
Oman (Muscat)	82.0	500	6	Independent kingdom	Maria Theresa dollar	1.20+			100*	200*
Palestine	9.0	770	86	British mandate	Pound (Egyptian)	4.9431			100	130
Persia	628.2	9,500	14	Independent kingdom	Kran	[1]	2.38		100	11
Philippine Islands	115.0	10,906	95	United States colony	Peso	.50	1.84			
Russia in Asia	6466.2	30,887	5	Soviet republic	Ruble	.5146			[2]	[2]
Russian Turkestan	571.6	7,202	13	Soviet republic	Ruble	.5146				
Sakhalin Island	13.3	106	8	Russian and Japanese.						
Sarawak	42.0	600	14	British colony	Dollar	.5678	.16			
Siam	194.6	9,322	48	Independent kingdom	Tical	.40 4	6.04		100*	11*
Siberia	3357.5	10,769	3	Soviet republic	Ruble	.5146			[2]	[2]
Sin-Kiang (Chinese Turkestan)	550.3	2,000	4	Uncertain						
Straits Settlements	1.6	882	550	British colony	Dollar	.5678	14.34			
Sumatra	159.8	5,848	37	Dutch colony	Guilder	.402				
Syria	60.0	3,000	50	French mandate	Pound	3.860			100	33
Tibet	463.2	2,000	4	Independent theocracy						
Transcaucasia	74.2	5,684	77	Soviet republic	Ruble	.5146				
Turkey	282.1	14,599	52	Independent republic.	Lira (pound)	4.40			100	7
AUSTRALASIA:										
Australia	2974.6	5,635	2	British dominion	Pound	4.8665	23.33		121	21
New South Wales	309.4	2,100	7	Australian state	Pound	4.8665				
Northern Territory	523.6	4		Australian territory	Pound	4.8665				
Queensland	670.5	758	1	Australian state	Pound	4.8665				
South Australia	380.1	495	1	Australian state	Pound	4.8665				
Tasmania	26.2	214	8	Australian state	Pound	4.8665				
Victoria	87.9	1,532	18	Australian state	Pound	4.8665				
West Australia	975.9	332	0.3	Australian state	Pound	4.8665				
Fiji Islands	7.1	155	22	British colony	Pound	4.8665				

Guam	0.2	14	70	U. S. possession	Dollar	1.00				
New Guinea (entire)	312.3	1,000	3	British and Dutch						
New Guinea and Papua	179.8	646	3	Australian mandate	Pound	4.8665			100*	155*
New Zealand	103.6	1,266	12	British dominion	Pound	4.8665			100	79
Samoa (American)	0.1	8	80	U. S. colony	Dollar	1.00				
(Western)	1.3	37	29	British colony	Pound	4.8665			100	2800
EUROPE:										
Albania	17.4	832	43	Independent republic	No unit					
Austria	30.8	6,423	199	Independent republic	Kronei	.2026	.12	672,519.73	100	120
Belgium	11.7	7,466	634	Independent republic	Franc	.193	8.25	907.53	785	122
Bulgaria	40.7	4,861	122	Independent kingdom	Lev	.193	1.95	693.83	512	69
Canary Islands	3.3	506	153	Part of Spain	Peseta	.193			100	20
Corsica	3.4	282	83	Part of France	Franc	.193				
Crete	3.3	347	105	Part of Greece	Drachma	.193				
Czecho-Slovakia	54.3	13,611	252	Independent republic	Krone	.2026		738.05	3073	226
Danzig	0.7	351		Free City	Mark	.2382			228	650
Denmark	17.1	3,290	193	Independent kingdom	Krone	.268	19.08	140.56	2,789	849
England	50.9	35,679	700	Part of Great Britain	Pound	4.8665				
Esthonia	18.4	1,171	61	Independent republic	Mark	.193	2.08	2,585.46	124	112
Finland	149.6	3,403	23	Independent republic	Mark	.193	2.54	426.44	471	138
France	212.7	39,210	184	Independent republic	Franc	.193	18.42	876.63	3,954	101
Germany	182.3	59,856	326	Independent republic	Mark	.2382	4.23	25,184.47	51,227	86
Great Britain[3]	94.4	44,108	468	Independent kingdom	Pound	4.8665	23.93	9.37	34,007	77
Greece	49.2	5,950	121	Independent republic	Drachma	.193	1.21	636.36	100	17
Hungary	35.8	7,951	222	Independent republic	Krone	.2026	.14	3,544.46	473	60
Iceland	39.7	95	2	Independent republic	Krone	.268	6.28	91.99	100	1,052
Ireland	32.6	4,390	135	Great Britain and Irish Free State	Pound	4.8665				
Irish Free State	27.0	3,156	117	British dominion	Pound	4.8665	3.89	4.56	28,567	9,050
Italy	120.0	38,835	324	Independent kingdom	Lira	.193	6.53	551.91	3,845	99
Latvia	25.4	1,851	73	Independent republic	Lat	.193	1.51	20.83	142	77
Lithuania	59.6	4,801	81	Independent republic	Litas	.10	.21	6.53	344	72
Luxemberg	1.0	264	264	Independent republic	Mark	.2382			100	379
Netherlands	13.2	6,977	528	Independent kingdom	Guilder	.402	39.83	152.83	1,648	235
Northern Ireland	5.6	1,340	239	Part of Great Britain	Pound	4.8665				
Norway	125.0	2,632	21	Independent kingdom	Krone	.268	17.43	145.38	6,453	2,460

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[1] Fluctuates with the price of silver.

[2] European Russia includes Russia in Asia.

[3] Including Northern Ireland.

TABLE 1—WORLD: AREA, POPULATION, GOVERNMENT, MONEY AND IMMIGRATION—*Continued*

Continent and Country	A Area (Thousands of Square Miles)	B Population (Thousands) (1923 or Nearest Available Date)	C Population per Square Mile	D Government	E Monetary Unit	F United States Equivalent at Par	G Gold and Silver per Capita, 1922	H Paper Money per Capita, 1922	I United States Immigration Quota, 1925–6.	J Immigrants Admissible per Million Population
EUROPE—*Continued.*										
Poland	149.2	27,179	182	Independent republic.	Mark	.2382	.75	30,070.39	5,982	220
Portugal	35.5	6,041	170	Independent republic.	Escudo	1.0805	4.74	175.73	503	83
Rumania	113.6	16,262	143	Independent kingdom	Lev	.193	.44	871.73	603	37
Russia, European	1807.0	102,555	57	Independent soviet republic	Ruble	.5146	.01	10,947.78	2,248[2]	17[2]
Ukraine	172.8	26,002	151	Soviet republic	Ruble	.5146				
White Russia	23.1	1,634	71	Soviet republic	Ruble	.5146				
Sardinia	9.3	881	95	Part of Italy	Lira	.193				
Scotland	30.4	4,882	161	Part of Great Britain.	Pound	4.8665				
Sicily	9.9	3,800	383	Part of Italy	Lira	.193				
Spain	195.0	21,338	109	Independent kingdom	Peseta	.193	28.74	194.37	131	6
Spitzbergen	25.0	1	.....	Norwegian possession.	Krone	.268				
Sweden	173.2	5,988	35	Independent kingdom	Krone	.268	13.38	98.94	9,561	1,600
Switzerland	15.9	3,886	244	Independent republic.	Franc	.193	32.19	256.61	2,081	537
United Kingdom (old area)	121.4	47,262	390							
Wales	7.5	2,207	294	Part of Great Britain.	Pound	4.8665				
Yugoslavia	96.1	12,017	125	Independent republic.	Dinar	.193	.....	362.32	671	55
NORTH AMERICA (Total):										
Alaska	590.9	55	0.1	Territory of U. S. A..	Dollar	1.00				
Bahama Islands	4.4	53	12	British colony	Pound	4.8665	3.65			
Bermuda Islands	0.02	22	1,100	British colony	Pound	4.8665				
British Honduras	8.6	45	5	British colony	Dollar	1.00	1.44	7.55		
Canada (See Table 2)	3729.7	8,967	2	British dominion	Dollar	1.00	.....	51.84		
Costa Rica	18.7	485	26	Independent republic.	Colon	.4653	1.27	30.17		
Cuba	44.2	2,899	65	Independent republic.	Peso	1.00	18.45	72.93		

Dominican Republic	19.3	897	47	Independent republic.	Dollar	1.00	.78	2.61	
Greenland	827.3	.....	.....	Danish colony	Krone	.268			
Greenland (inhabited part)	46.7	14	0.3	Danish colony	Krone	.268			
Guatemala	43.6	2,005	46	Independent republic.	Peso	[1]	.....	80.64	
Haiti	11.1	1,631	147	Independent republic.	Gourde	.20	.23	3.53	
Hawaii	6.4	299	47	Territory of U. S. A.	Dollar	1.00			
Honduras	46.3	662	14	Independent republic.	Peso	[1]	.49	.86	
Jamaica	4.5	869	193	British colony	Pound	4.8665	.28	15.10	
Labrador	120.0	4	.....	British colony	Dollar	1.00			
Mexico	767.3	14,463	19	Independent republic.	Peso	.4985	5.17		
Newfoundland	42.7	264	6	British colony	Dollar	1.00	12.45	7.55	
Nicaragua	49.6	638	13	Independent republic.	Cordoba	1.00	.49	11.58	
Panama	32.4	434	13	Independent republic.	Balboa	1.00	.15		
Panama Canal Zone	0.4	24	60	United States lease	Dollar	1.00			
Porto Rico	3.4	1,347	396	Unites States colony.	Dollar	1.00			
Salvador	13.2	1,526	116	Independent republic.	Colon	.50	1.05	6.25	
United States (See Table 2)	2973.8	110,664	36	Independent republic.	Dollar	1.00	42.26	35.91	
Virgin Islands	0.1	26	198	U. S. possession	Dollar	.965	7.32	24.76	
SOUTH AMERICA (Total):									
Argentina	1136.1	8,699	8	Independent republic.	Peso	.9648	57.79	159.68	
Bolivia	613.9	2,890	5	Independent republic.	Boliviano	.3893	.285	11.68	
Brazil	3145.6	30,636	10	Independent republic.	Milreis	.5462	1.57	75.43	
British Guiana	89.5	298	3	British colony	Pound	4.8665	5.10	7.38	
Chile	289.8	3,819	13	Independent republic.	Peso	.365	9.14	80.42	
Colombia	435.3	6,300	14	Independent republic.	Peso	.9733	5.10	1.82	
Dutch Guiana	46.1	113	2	Dutch colony	Guilder	.402	.41	15.82	
Ecuador	118.6	2,000	17	Independent republic.	Sucre	.4867	3.28	8.00	
French Guiana	32.0	49	2	French colony	Franc	.193	.....	353.84	
Paraguay	97.7	1,000	10	Independent republic.	Peso	.9648	.65	180.00	
Peru	533.9	7,300	14	Independent republic.	Pound	4.8665	5.98	1.18	
Uruguay	72.2	1,529	21	Independent republic.	Peso	1.0342	41.82	48.95	
Venezuela	394.0	2,412	6	Independent republic.	Bolivar	.193	10.16	16.17	
WORLD (Total):									

[1] Fluctuates with the price of silver.
[2] Includes Russia in Asia.

TABLE 2—UNITED STATES (1920) AND CANADA (1921). AREA, POPULATION, URBAN DISTRIBUTION, RACE AND AGE

State	A Land Area in Square Miles	B Population	C Population per Square Mile	D Population in Per Cent of Total	E Per Cent Urban. Towns Over 2500	F Per Cent in Cities Over 100,000	G Per Cent Native White	H Per Cent Foreign-born White	I Per Cent Negro	J Per Cent Under 10 Years of Age
NEW ENGLAND:										
Maine	29,895	768,014	25.7	0.7	39.0	0.0	85.7	14.0	0.2	19.1
New Hampshire	9,031	443,083	49.1	0.3	63.1	0.0	79.2	20.6	0.1	19.3
Vermont	9,124	352,428	38.6	0.3	81.2	0.0	87.2	12.6	0.2	19.3
Massachusetts	8,039	3,852,356	479.2	3.6	94.8	39.5	70.8	28.0	1.2	19.3
Rhode Island	1,067	604,397	566.4	0.6	97.5	39.3	69.6	28.7	1.7	19.9
Connecticut	4,820	1,380,631	286.4	1.3	67.8	32.2	71.1	27.3	1.5	21.2
MIDDLE ATLANTIC:										
New York	47,654	10,385,227	217.9	9.8	82.7	65.6	71.1	26.8	1.9	19.1
New Jersey	7,514	3,155,900	420.0	3.0	78.4	34.4	72.8	23.4	3.7	20.9
Pennsylvania	44,832	8,720,017	194.5	8.2	64.3	30.5	80.8	15.9	3.3	22.3
EAST NORTH CENTRAL:										
Ohio	40,740	5,759,394	141.4	5.5	63.8	37.7	85.0	11.8	3.2	19.7
Indiana	36,045	2,930,390	81.3	2.8	50.6	10.7	92.1	5.1	2.8	19.6
Illinois	56,043	6,485,280	115.7	6.1	67.9	41.7	78.5	18.6	2.8	20.0
Michigan	57,480	3,668,412	63.8	3.5	61.1	30.8	78.4	19.8	1.6	21.6
Wisconsin	55,256	2,632,067	47.6	2.5	47.3	17.4	81.9	17.5	0.2	21.3
WEST NORTH CENTRAL:										
Minnesota	80,858	2,387,125	29.5	2.3	44.1	25.8	78.9	20.4	0.4	21.4
Iowa	55,586	2,404,021	43.2	2.3	36.4	5.3	89.8	9.4	0.8	20.4
Missouri	68,727	3,404,055	49.5	3.2	46.6	32.2	89.3	5.5	5.2	19.5
North Dakota	70,183	646,872	9.2	0.6	13.6	0.0	78.6	20.3	0.1	27.4
South Dakota	76,868	636,547	8.3	0.6	16.0	0.0	84.3	12.9	0.1	24.2
Nebraska	76,808	1,296,372	16.9	1.2	31.3	14.8	87.1	11.5	1.0	21.8
Kansas	81,774	1,769,257	21.6	1.6	34.9	5.7	90.3	6.2	3.3	21.1
SOUTH ATLANTIC										
Delaware	1,965	223,003	113.5	0.2	54.2	49.4	77.5	8.9	13.6	19.8
Maryland	9,941	1,449,661	145.8	1.4	60.0	50.6	76.1	7.0	16.9	20.0
Virginia	40,262	2,309,187	57.4	2.2	29.2	12.4	68.7	1.3	29.9	24.3
West Virginia	24,022	1,463,701	60.9	1.4	25.2	0.0	89.9	4.2	5.9	26.0
North Carolina	48,740	2,559,123	52.5	2.4	19.2	0.0	69.4	0.3	29.8	27.9
South Carolina	30,495	1,683,724	55.2	1.6	17.5	0.0	48.2	0.4	51.4	27.6
Georgia	58,725	2,895,832	49.3	2.7	25.1	6.9	57.8	0.6	41.7	25.7
Florida	54,861	968,470	17.7	0.9	36.7	0.0	61.5	4.4	34.0	22.4

EAST SOUTH CENTRAL:										
Kentucky	40,181	2,416,630	60.1	2.3	26.2	9.7	89.0	1.3	9.8	24.0
Tennessee	41,687	2,337,885	56.1	2.2	26.1	12.0	80.0	0.7	19.3	24.2
Alabama	51,279	2,348,174	45.8	2.2	21.7	7.6	60.9	0.8	38.4	26.4
Mississippi	46,362	1,790,618	38.6	1.7	13.4	0.0	47.2	0.4	52.2	25.3
WEST SOUTH CENTRAL:										
Arkansas	52,525	1,752,204	33.4	1.7	16.6	0.0	72.2	0.8	27.0	25.6
Louisiana	45,409	1,798,509	39.6	1.7	34.9	21.5	58.5	2.5	38.9	24.0
Oklahoma	69,414	2,028,283	29.2	1.9	26.6	0.0	87.8	2.0	7.4	25.4
Texas	262,398	4,663,228	17.8	4.4	32.4	12.1	76.3	7.7	15.9	23.7
MOUNTAIN:										
Montana	146,201	548,889	3.8	0.5	31.3	0.0	80.3	17.1	0.3	23.2
Idaho	83,354	431,866	5.2	0.4	27.6	0.0	89.5	9.0	0.2	24.5
Wyoming	97,594	194,402	2.0	0.2	29.5	0.0	84.8	13.0	0.7	22.3
Colorado	103,658	939,629	9.1	0.9	48.2	27.3	85.9	12.4	1.2	20.4
New Mexico	122,503	360,350	2.9	0.3	18.0	0.0	84.8	8.1	1.6	25.9
Arizona	113,810	334,162	2.9	0.3	35.2	0.0	63.8	23.4	2.4	23.5
Utah	82,184	449,396	5.5	0.4	48.0	26.3	85.8	12.6	0.3	26.3
Nevada	109,821	77,407	0.7	0.1	19.7	0.0	72.2	19.1	0.4	17.4
PACIFIC:										
Washington	66,836	1,356,621	20.3	1.3	55.2	30.9	78.9	18.4	0.5	18.8
Oregon	95,607	783,389	8.2	0.7	49.9	33.0	85.1	13.0	0.3	18.4
California	155,652	3,426,861	22.0	3.2	68.0	37.9	75.4	19.9	1.1	16.2
UNITED STATES	(See Table 1)		35.5	.....	51.4	25.9	76.7	13.0	9.9	21.7
CANADA:										
Alberta	*83,256 252,925	*457,539 588,454	*5.5 2.3	6.7	24.2	0.0	51.4	46.4	.....	26.2
British Columbia	*64,826 353,416	*455,814 524,582	*7.0 1.5	6.0	43.0	22.4	44.9	49.6	.....	19.8
Manitoba	*57,951 231,926	*590,312 610,118	*10.0 2.6	6.9	37.8	29.3	61.2	36.7	.....	25.9
New Brunswick	27,911	387,876	13.9	4.4	26.8	0.0	94.0	5.2	0.1	24.7
Northwest Territories	1,207,926	7,988	0.007	0.1	0.0	0.0	8.3	2.2		
Nova Scotia	21,068	523,837	24.9	6.0	38.0	0.0	90.2	8.1	0.6	23.0
Ontario	*158,309 365,880	*2,893,386 2,933,662	*18.3 8.0	33.4	49.8	28.6	77.0	21.9	0.1	20.8
Prince Edward Island	2,184	88,615	40.6	1.0	17.5	0.0	98.2	1.5	.....	21.9
Quebec	*198,726 690,865	*2,270,590 2,361,199	*16.4 3.4	26.9	45.4	26.0	91.5	8.1	.....	26.4
Saskatchewan	*94,010 242,808	*653,300 757,510	*7.0 3.1	8.6	14.0	0.0	58.7	39.6	.....	29.0
Yukon	206,427	4,157	0.02	.....	0.0	0.0	29.0	37.5		
CANADA	*708,239	*8,321,269	*11.7	.....	40.5	18.9	76.2	22.3	.....	24.0

* Excluding relatively unorganized areas with less than 1 person per square mile.

TABLE 3—UNITED STATES AND CANADA: RACIAL COMPOSITION

Foreign-born whites in the United States by country of origin, 1920, and population of Canada by racial origin in 1921, per 1000 population.

State	A Great Britain	B Ireland	C Scandinavia and Finland	D Low Countries, France and Switzerland	E Germany and Austria	F Poland, Czecho-Slovakia, Hungary and Jugoslavia	G Russia and South-east Europe	H South Europe (Peninsulas)	I Armenia, Syria and Turkey in Asia	J Canada	K Mexico
Alabama	1	.....	1	.....	1	1	1	2			
Arizona	11	4	6	2	6	5	2	8	1	6	180
Arkansas	1	.....	.....	1	3	1	.....	1	.....	1	
California	24	14	22	14	24	8	8	40	2	10	26
Colorado	15	7	16	4	19	7	18	15	.....	8	12
Connecticut	22	33	17	4	26	49	37	62	2	18	
Delaware	9	13	1	1	10	19	12	23	.....	2	
Florida	6	1	3	1	4	1	2	10	.....	4	7*
Georgia	1	.....	.....	.....	1	1	1	1			
Idaho	15	3	25	5	11	2	3	8	.....	11	3
Illinois	12	12	24	7	39	44	24	17	.....	6	1
Indiana	4	2	2	3	16	12	4	4	.....	2	
Iowa	8	4	24	8	31	6	3	3	.....	4	1
Kansas	7	3	8	4	16	5	7	2	.....	.....	8
Kentucky	1	1	.....	1	5	1	1	1			
Louisiana	1	1	1	3	3	1	1	10	1	1	1
Maine	10	8	7	.....	2	3	8	5	1	97	
Maryland	5	5	1	1	17	13	19	7	.....	1	
Massachusetts	30	48	16	3	8	19	29	43	4	70	
Michigan	17	5	19	14	29	40	16	10	2	45	
Minnesota	6	4	104	5	36	19	8	4	.....	14	
Mississippi	.....	.....	.....	.....	1	.....	.....	1			
Missouri	4	4	2	3	19	7	6	1	.....	2	1
Montana	22	13	43	8	20	14	10	10	.....	26	
Nebraska	6	4	26	3	35	17	12	4	.....	4	2
Nevada	28	13	19	13	16	10	2	59	.....	15	15
New Hampshire	14	18	9	2	5	9	10	17	2	106	
New Jersey	21	21	7	11	41	48	27	52	1	3	
New Mexico	4	1	2	1	5	3	1	6	1	2	45
New York	17	27	10	6	43	36	56	56	1	11	
North Carolina	1										
North Dakota	5	3	84	4	22	11	49	1	.....	24	
Ohio	11	5	3	4	28	37	11	13	1	4	
Oklahoma	2	1	1	1	2	2	2	1	.....	1	3
Oregon	16	5	35	9	21	6	9	9	.....	22	1
Pennsylvania	16	14	3	3	28	41	23	27	1	2	
Rhode Island	52	37	12	5	7	13	15	70	5	60	
South Carolina	.....	.....	.....	.....	1	.....	1	1			
South Dakota	6	3	51	7	26	7	18	1	.....	7	
Tennessee	1	1	.....	.....	1	1	1	1			
Texas	2	1	2	1	8	4	2	2	.....	1	53
Utah	41	3	36	9	10	2	2	14	.....	3	2
Vermont	13	8	5	1	3	6	4	14	1	70	
Virginia	2	1	1	.....	2	1	2	2	.....	1	
Washington	23	7	63	8	21	8	8	11	.....	32	
West Virginia	.....	.....	.....	.....	1	1	.....	1			
Wisconsin	6	3	35	8	65	34	10	6	1	7	
Wyoming	22	5	23	3	18	14	8	16	.....	7	9
UNITED STATES	11	10	13	4	21	20	16	18	1	11	5
Alberta	480	116	80	75	93	20	80	7			
British Columbia	636	104	41	55	196	7	16	18			
Manitoba	457	117	15	112	83	30	97	4	1		
New Brunswick	474	176	6	401	5	.....	1	1			
Nova Scotia	672	104	3	133	53	3	2	3	2		
Ontario	645	133	1	103	49	7	7	12	1		
Prince Edward Island	642	212	.....	138	3						
Quebec	111	40	1	803	3	1	2	8	1		
Saskatchewan	417	112	75	86	143	27	104	1	1		
CANADA	429	126	20	295	46	9	25	8	1		

* Cuba.

TABLE 4—WORLD: CITIES OF OVER 200,000 POPULATION (1924 OR NEAREST AVAILABLE DATE)

Continent and Country	Population, in Thousands
AFRICA:	
Algeria:	
Algiers	207
Egypt:	
Alexandria	445
Cairo	791
ASIA:	
China: *	
Amoy	300
Canton	900
Changsha	536
Chungking	539
Foochow	321
Hangchow	340
Hankow	1647
Hongkong	625
Nanking	402
Ningpo	284
Peking	924
Shanghai	1500
Suchow	500
Tientsin	800
Chosen:	
Seoul	271
India:	
Ahmedabad	274
Bangalore	237
Benares	198
Bombay	1176
Calcutta	1132
Cawnpore	216
Colombo	244
Delhi	304
Hyderabad	404
Karachi	217
Lahore	282
Lucknow	241
Madras	527
Rangoon	342
Japan:	
Kobe	609
Kyoto	591
Nagoya	430
Osaka	1253
Tokyo	2173
Yokohama	423
Java:	
Batavia	306
Suerabaya	200
Mesopotamia:	
Bagdad	250
Persia:	
Tabriz	200
Teheran	220
Philippine Islands:	
Manila	285
Russia in Asia:	
Baku	250
Tashkent	272
Tiflis	328
Siam:	
Bangkok	400
Straits Settlements:	
Singapore	426
Turkey:	
Smyrna	425
AUSTRALIA:	
Adelaide	279
Brisbane	236
Melbourne	853
Sydney	981
EUROPE:	
Austria:	
Vienna	1866
Belgium:	
Antwerp	301
Brussels	787
Czecho-slovakia:	
Prague	676
Brunn	221
Denmark:	
Copenhagen	561
France:	
Bordeaux	267
Lille	201
Lyon	562
Marseille	586
Paris	2906
Germany:	
Berlin	3804
Bremen	270
Breslau	528
Chemnitz	304
Cologne	641
Dortmund	295
Dresden	588
Duisburg	244
Düsseldorf	407
Essen	439
Frankfort	433
Hamburg	986
Hanover	393
Kiel	214
Königsberg	261
Leipzig	636
Magdeburg	286
Mannheim	229
Munich	631
Nürnberg	362
Stettin	233
Stuttgart	324
Great Britain:	
Birmingham	919
Bradford	286
Cardiff	200
Bristol	377
Edinburgh and Leith	420
Glasgow	1034
Kingston	287
Leeds	458
Leicester	234
Liverpool	803
London	4564
Manchester	731
Newcastle	275
Newport (Monmouth)	275
Nottingham	263
Plymouth	210
Portsmouth	247
Salford	234
Sheffield	491
Stoke-upon-Trent	240
West Ham	301
Greece:	
Athens and Piraeus	426
Salonika	500
Hungary:	
Budapest	1929
Ireland:	
Belfast	429
Dublin	435
Italy:	
Catania	252
Florence	254
Genoa	316
Milan	836
Naples	772
Palermo	394
Rome	692
Trieste	239
Turin	502
Latvia:	
Riga	285
Netherlands:	
Amsterdam	706
Hague	383
Rotterdam	537
Norway:	
Oslo	258
Poland:	
Lwow	219
Lodz	452
Warsaw	936
Portugal:	
Lisbon	486
Oporto	203
Rumania:	
Bucharest	309
Russia:	
Kharkof	258
Kiev	404
Leningrad	1067
Moscow	1511
Odessa	631
Spain:	
Barcelona	761
Madrid	814
Valencia	256
Sweden:	
Stockholm	419
Turkey:	
Constantinople (with Scutari)	1041
NORTH AMERICA:	
Canada:	
Montreal	619
Toronto	523
Cuba:	
Havana	782
Mexico:	
Mexico City	615
United States:	
See Table 6.	
SOUTH AMERICA:	
Argentina:	
Buenos Aires	1811
Rosario	265
Brazil:	
Bahia (S. Salvador)	283
Para (Belem)	236
Pernambuco (Recife)	239
Rio de Janeiro	1158
San Paulo	579
Chile:	
Santiago	507
Uruguay:	
Montevideo	362

* List probably incomplete.

TABLE 5—EUROPE: PERCENTAGE OF POPULATION IN TOWNS OF OVER 50,000

Country	Per Cent, Urban		Country	Per Cent, Urban	
	1913 A	1920–24 B		1913 A	1920–24 B
Austria	14	35	Latvia	.....	16
Belgium	19	19	Lithuania	.....	17
Bulgaria	3½	5½	Netherlands	30	32
Czechoslovakia	.....	9	Northern Ireland	.....	34
Denmark	22	23	Norway	13	15
England	48	56	Poland	13	10
Esthonia	.....	7	Portugal	11	11
Finland	5	8	Rumania	9	7
France	21	21	Russia	9	3
Germany	25	30	Scotland	38	41
Greece	9	13	Spain	14	18
Hungary	5	22	Sweden	12	13
Irish Free State	18*	14	Switzerland	15	20
Italy	16	15	Yugoslavia ..... (Serbia 3)		4

* Old Ireland.

TABLE 6.—UNITED STATES. CITIES OF OVER 100,000 POPULATION, AND METROPOLITAN DISTRICTS, 1920

City and State.	A. Population, 1920.	B. Population of Metropolitan District, 1920.	City and State.	A. Population, 1920.	B. Population of Metropolitan District, 1920.
Akron, Ohio	208,435	285,113	Nashville, Tenn	118,342	.....
Albany, N. Y	113,344	.....	Newark N. J	414,524	.....
Atlanta, Ga	200,616	249,226	New Bedford, Mass	121,272	.....
Baltimore, Md	733,826	787,458	New Haven, Conn	162,537	.....
Birmingham, Ala	178,806	.....	New Orleans, La	387,219	397,915
Boston, Mass	748,060	1,772,254	New York, N. Y	5,620,048	7,910,415
Bridgeport, Conn	143,555	.....	Norfolk, Va	115,777	.....
Buffalo, N. Y	506,775	602,847	Oakland, Calif	216,261	(3)
Cambridge, Mass	109,694	.....	Omaha, Nebr	191,601	.....
Camden, N. J	116,309	.....	Paterson, N. J	135,875	.....
Chicago, Ill	2,701,705	3,178,924	Philadelphia, Pa	1,823,779	2,407,234
Cincinnati, Ohio	401,247	606,850	Pittsburgh, Pa	588,343	1,207,504
Cleveland, Ohio	796,841	925,720	Portland, Ore	258,288	299,882
Columbus, Ohio	237,031	260,338	Providence, R. I	237,595	444,228
Dallas, Texas	158,976	.....	Reading, Pa	107,784	.....
Dayton, Ohio	152,559	.....	Richmond, Va	171,667	.....
Denver, Colo	256,491	264,232	Rochester, N. Y	295,750	320,966
Des Moines, Iowa	126,468	.....	Salt Lake City, Utah	118,110	.....
Detroit, Mich	993,678	1,165,153	San Antonio, Texas	161,379	.....
Fall River, Mass	120,485	.....	San Francisco, Calif	506,676	891,477
Forth Worth, Texas	106,482	.....	Scranton, Pa	137,783	.....
Grand Rapids, Mich	137,634	.....	Seattle, Wash	315,312	357,950
Hartford, Conn	138,036	.....	Spokane, Wash	104,437	.....
Houston, Texas	138,276	.....	Springfield, Mass	129,614	.....
Indianapolis, Ind	314,194	339,105	St. Louis, Mo	772,897	952,012
Jersey City, N. J	298,103	.....	St. Paul, Minn	234,698	(2)
Kansas City, Kansas	101,177	(1)	Syracuse, N. Y	171,717	.....
Kansas City, Mo	324,410	477,354	Toledo, Ohio	243,164	263,717
Los Angeles, Calif	576,673	879,008	Trenton, N. J	119,289	.....
Louisville, Ky	234,891	318,159	Washington, D. C	437,571	506,588
Lowell, Mass	112,759	.....	Wilmington, Del	110,168	.....
Memphis, Tenn	162,351	.....	Worcester, Mass	179,754	.....
Milwaukee, Wis	457,147	537,737	Yonkers, N. Y	100,176	.....
Minneapolis, Minn	380,582	629,216	Youngstown, Ohio	132,358	.....

(1) Included with metropolitan district of Kansas City, Mo.
(2) Included with metropolitan district of Minneapolis, Minn.
(3) Included with metropolitan district of San Francisco, Calif.

SECTION III.—OCCUPATIONS

TABLE 7.—WORLD. PERCENTAGE OF GAINFULLY EMPLOYED POPULATION ENGAGED IN AGRICULTURE

(Data from other countries not available)

Source: D.

Continent and Country.	A. Year.	B. Percentage Engaged in Agriculture.
AFRICA		
Algeria	1881	71.3
Egypt	1907	65.6
Sierra Leone	1901	25.9
Union of South Africa	1904	65.1
ASIA		
British India	1901	67.9
British North Borneo	1901	64.2
Ceylon	1901	65.1
Federated Malay States	1901	35.5
Formosa	1905	73.3
Philippine Islands	1903	41.3
Russia in Asia	1897	65.3
AUSTRALASIA		
Australia	1911	24.3
New Zealand	1911	24.5
EUROPE		
Austria	1900	60.9
Belgium	1900	21.9
Bulgaria	1905	82.4
Cyprus	1901	54.5
Denmark	1911	40.3
England and Wales	1911	7.8
Finland	1900	48.0
France	1906	42.4
EUROPE—*Continued*		
Germany	1907	34.6
Greece	1907	44.6
Hungary	1901	69.7
Ireland	1911	43.0
Italy	1901	58.8
Netherlands	1899	29.6
Norway	1910	33.4
Portugal	1900	61.4
Russia in Europe	1897	55.6
Scotland	1911	11.0
Serbia	1900	64.7
Spain	1900	56.9
Sweden	1900	52.8
Switzerland	1900	30.4
NORTH AMERICA		
Canada	1901	39.9
Cuba	1907	47.6
Jamaica	1911	66.1
Porto Rico	1899	62.8
United States	1920	26.3
SOUTH AMERICA		
Argentina	1895	23.6
Bolivia	1900	43.5
Chile	1907	37.7
Trinidad and Tobago	1901	48.4

TABLE 8.—UNITED STATES. OCCUPATIONS, 1920

Source: B.

Division and States.	A. Persons Engaged in Gainful Occupations.	B. Persons Engaged in Gainful Occupations.	C.	D.	E.	F.	G.	H.	I.	J.	K.
			Per Cent of Persons in general Occupational Classes.								
	Per Cent of Males 10 Years and Over.	Per Cent of Females 10 Years and Over.	Agriculture and Forestry.	Extraction of Minerals.	Manufacturing and Mechanical Industries.	Transportation.	Trade.	Public Service.	Professional Service.	Domestic and Personal Service.	Clerical Occupations.
NEW ENGLAND:											
Maine	77.9	21.1	25	2.4	39	7.9	8.9	1.8	5.4	7.8	4.9
N. Hampshire	79.2	27.3	16	2.1	51	6.4	7.6	1.5	4.9	7.3	4.8
Vermont	77.2	19.2	32	1.4	32	6.7	7.9	1.3	5.5	8.4	4.6
Massachusetts	80.9	31.6	3	0.1	51	7.1	11.2	2.2	5.7	8.6	10.4
Rhode Island	82.0	32.7	3	0.0	59	5.8	9.6	3.1	4.4	7.0	8.1
Connecticut	81.0	27.1	6	0.0	54	5.6	9.5	1.7	5.3	7.1	10.4
MIDDLE ATLANTIC:											
New York	80.4	26.9	7	0.2	39	9.0	13.1	2.2	6.3	10.4	12.6
New Jersey	80.8	23.9	5	0.3	48	8.5	11.0	2.6	5.4	8.0	11.5
Pennsylvania	79.5	20.7	8	9.7	42	8.3	9.9	1.6	4.9	7.4	8.3
EAST NORTH CENTRAL:											
Ohio	79.4	18.3	16	2.6	42	7.5	10.7	1.4	5.1	7.0	8.2
Indiana	77.7	16.0	26	3.0	32	7.5	10.3	1.3	5.1	6.5	6.2
Illinois	78.8	21.3	14	3.3	33	8.4	13.3	1.9	5.6	8.2	11.3
Michigan	80.0	18.1	20	1.9	42	6.2	9.6	1.4	4.9	6.5	7.7
Wisconsin	75.8	18.3	31	0.4	34	6.1	9.2	1.1	5.2	6.9	6.1
WEST NORTH CENTRAL:											
Minnesota	75.2	18.4	34	1.7	22	7.7	11.5	1.3	6.1	7.8	7.5
Iowa	73.2	15.2	38	1.7	20	7.8	11.9	1.1	6.5	6.9	5.4
Missouri	77.4	18.1	30	1.6	25	7.8	12.0	1.4	5.2	8.6	8.0
North Dakota	70.9	13.0	58	0.6	9	6.0	9.1	0.8	6.3	6.4	3.6
South Dakota	72.2	13.3	54	0.7	12	5.9	10.1	0.9	6.4	6.1	3.6
Nebraska	72.9	14.8	41	0.0	18	8.0	12.0	1.2	6.6	6.8	5.9
Kansas	73.8	13.7	37	3.3	19	9.2	10.8	2.0	6.2	6.6	5.3
SOUTH ATLANTIC:											
Delaware	79.7	20.8	19	0.0	38	8.7	8.9	1.7	4.6	9.5	9.1
Maryland	80.0	23.8	16	1.1	34	9.3	11.0	3.6	4.9	11.1	8.8
Virginia	76.4	18.1	36	2.0	23	7.6	7.8	3.8	4.1	10.1	4.8
West Virginia	76.0	11.2	25	21.1	24	7.7	9.0	0.9	4.6	5.5	3.8
N. Carolina	75.5	21.9	53	0.2	23	4.1	5.9	1.0	3.3	6.3	2.3
S. Carolina	77.6	33.4	62	0.1	16	3.3	5.0	1.6	2.7	7.0	1.8
Georgia	78.6	26.7	51	0.2	16	4.9	6.8	1.7	3.1	9.5	3.4
Florida	77.7	23.3	32	0.8	26	7.6	9.3	2.0	4.5	13.5	4.0
EAST SOUTH CENTRAL:											
Kentucky	77.1	14.5	46	6.0	17	5.9	7.6	2.0	3.7	7.1	4.1
Tennessee	76.5	17.2	48	2.1	18	6.2	8.1	0.9	3.7	8.8	3.7
Alabama	79.5	25.8	55	3.9	17	4.6	5.5	0.7	2.8	7.8	2.4
Mississippi	78.7	29.1	70	0.0	10	3.8	4.3	0.7	2.7	6.3	1.6
WEST SOUTH CENTRAL:											
Arkansas	77.7	18.2	65	0.9	12	4.5	6.1	1.3	3.2	5.5	2.1
Louisiana	77.2	22.4	43	1.1	20	7.5	7.9	1.5	3.4	10.7	4.7
Oklahoma	73.6	13.2	46	5.6	15	6.4	9.5	1.3	5.0	6.2	4.4
Texas	76.6	17.8	46	1.8	16	7.3	9.4	2.7	4.4	7.8	4.7
MOUNTAIN:											
Montana	78.9	15.2	40	7.8	15	8.8	8.9	1.4	5.9	7.3	4.9
Idaho	75.5	12.0	47	3.4	16	7.3	9.0	1.1	5.8	6.0	4.0
Wyoming	81.7	15.0	32	10.8	19	12.1	7.5	1.9	5.1	7.5	4.3
Colorado	76.8	17.8	27	6.4	20	8.8	12.5	1.9	6.8	9.0	6.8
New Mexico	74.5	12.1	45	6.0	13	9.0	6.6	5.3	5.1	6.9	2.9
Arizona	78.1	16.4	28	11.8	18	8.9	8.6	6.4	5.5	4.8	7.8
Utah	74.0	13.7	39	6.8	22	8.3	11.0	1.7	6.7	6.8	7.1
Nevada	84.3	17.7	23	16.5	19	11.5	7.5	1.6	6.3	10.0	4.6
PACIFIC:											
Washington	80.3	18.7	23	1.5	31	9.2	11.6	2.2	6.3	8.1	7.1
Oregon	78.1	18.4	28	0.7	27	9.0	11.4	1.5	6.8	7.8	6.8
California	80.0	21.4	18	1.6	28	8.2	13.8	3.0	7.7	10.2	8.8
UNITED STATES	78.2	21.2	26	2.6	31	7.4	10.2	1.9	5.2	8.2	7.5

TABLES PERTAINING TO AGRICULTURE

TABLE 9—WORLD: THE USE OF THE LAND, 1923

Continent and Country	Percentage of Total Area				Area under Cereals	
	A Arable Land	B Permanent Grass and Pasture	C Wood and Forest	D Other Land	E Percentage of Arable Land	F Percentage of Total Area
AFRICA:						
Algeria	9.9	1.7	5.7	82.9	64.9	6.0
Egypt	2.2	.....	.....	97.8	48.4	1.1
Morocco (French)	8.9	20.0	2.0	69.6	92.2	8.2
Tunis	25.4	0.7	8.8	68.1	39.9	10.2
Union of South Africa	3.1	.....	0.2	96.7	68.4	2.2
ASIA:						
China	12.4(?)	(?)	(?)	(?)	(?)	(?)
Chosen	21.9	(72.3)		5.8	(?)	(?)
Formosa	22.3	.....	.....	77.7	65.0	14.5
India (British)	45.8	.....	12.9	46.4[1]	32.3	24.0
India (Native States)	58.9	.....	13.2	30.9[1]	47.8	28.1
Indo-China (French)	7.1	.....	35.8	57.1	87.2	6.2
Japan	20.7	.....	48.4	30.9	70.9	14.8
Java	42.5	(16.5)		41.0		
Russia in Asia	0.9	0.7	16.2	82.2	93.3	0.8
AUSTRALASIA:						
Australia	1.1	.....	3.8	95.1[1]	54.9	0.6
New Zealand	3.0	.....	25.7	71.3	22.3	0.7
EUROPE:						
Austria	22.3	28.2	37.8	11.7	58.7	13.1
Belgium	39.8	16.7	23.1	20.4	57.3	22.8
Bulgaria	31.7	3.2	29.5	35.6	65.2	20.6
Czechoslovakia	42.1	18.5	33.2	6.2	54.0	22.7
Denmark	62.2	12.8	8.5	16.5	45.7	28.4
Esthonia	23.4	41.2	20.5	15.1	52.7	12.3
Finland	6.1	3.7	60.0	30.2	37.8	2.3
France	41.8	20.0	19.0	19.2	48.9	20.6
Germany	42.6	16.9	34.8	5.7	54.5	23.3
Great Britain	24.9	54.0	5.3	15.8	45.3	11.3
Hungary	58.9	23.3	14.0	3.8	68.7	40.5
Irish Free State	21.9	68.1	1.7	8.3	26.2	5.7
Italy	42.9	21.9	18.0	17.2	53.4	22.9
Latvia	25.1	25.0	26.7	23.2	52.1	13.1
Luxemberg	43.6	15.4	30.9	10.1	48.7	21.2
Netherlands	28.2	38.2	7.3	26.3	49.2	13.9
Northern Ireland	37.4	50.5	1.0	11.1	32.0	11.9
Norway	2.5	1.0	23.0	73.8	25.7	0.6
Poland	35.7	.....	25.0	.....	72.1	25.7
Portugal	35.0	21.6	22.0	21.4		
Rumania	36.2	64.9	27.8	31.1	90.2	32.6
Russia (old boundaries)	19.2	5.3	30.2	45.3	90.4	17.4
Spain	31.7	36.1	14.0	19.3	48.3	15.3
Sweden	9.3	7.2	55.0	28.6	43.3	4.0
Switzerland	26.4	16.7	23.8	33.1	10.9	2.9
Yugoslovia	25.7	16.9	30.6	26.8	70.5	18.1
NORTH AMERICA:						
Canada	2.5	0.4	25.0	72.1	75.5	1.9
Costa Rica	4.8	2.6	13.1(?)	79.5	8.2	0.4
Cuba	3.2	14.8	12.8	69.2	9.0	0.3
Porto Rico	24.8	46.0				
United States	17.6	16.6	28.9	36.9	66.9	11.8
SOUTH AMERICA:						
Argentina	17.1	20.5	36.1	26.3	52.6	3.8
Chile	2.5	13.5	6.7	77.3	35.6	0.9
Uruguay	4.4	81.6	2.3	11.7	74.4	3.3

[1] Inclusive of permanent grass and pasture.

TABLE 10.—UNITED STATES. USE, VALUE AND TENURE OF LAND, AND RACE OF FARMERS, 1920.

Sources: B and D.

State.	A. Per Cent of Improved Land.	B. Average Size of Farms in Acres.	C. Average Area of Improved Land per Farm.	D. Average Value per Farm.	E. Average Value of All Farm Land per Acre.	F. Average Value of Good Plow Land per Acre.	G. Per Cent of Farms Worked by Owners.	H. Per Cent of Farms Worked by Managers.	I. Per Cent of Farms Worked by Tenants.	J. Per Cent of Native-born White Farmers.	K. Per Cent of Foreign-born White Farmers.	L. Country of Most Numerous Foreign Farmers.	M. Per Cent of Colored Farmers.	N. Race of Most Numerous Colored Farmers.
Ala.	30	76	39	$ 2,698	$ 21	$ 43	41.8	0.3	57.9	62.4	0.4	Germany	37.2	Negro
Ariz.	1	582	72	23,418	27	180	78.9	3.1	18.1	82.9	10.7	Mexico	6.4	Indian
Ark.	27	75	40	3,974	35	65	48.4	0.3	51.3	68.0	0.9	Germany	31.1	Negro
Calif.	13	250	101	29,158	95	175	74.4	4.2	21.4	65.3	29.0	Italy	5.7	Japanese
Colo.	12	408	129	17,966	31	88	75.6	1.5	23.0	83.2	15.9	Russia	0.9	Japanese
Conn.	23	84	31	10,019	53	100	86.8	4.7	8.5	66.0	33.6	Germany	0.4	Negro
Del.	52	93	14	7,903	45	86	59.3	1.4	39.3	87.9	3.6	Germany	8.5	Negro
Fla.	7	112	43	6,116	38	53	71.3	3.4	25.3	72.0	4.1	Germany	23.9	Negro
Ga.	35	82	42	4,366	35	63	32.9	0.5	66.6	58.0	0.1	Germany	41.9	Negro
Idaho	8	199	107	17,008	61	135	82.3	1.8	15.9	83.8	15.0	Germany	1.2	Indian
Ill.	76	135	115	28,108	164	213	55.9	1.4	42.7	90.5	9.3	Germany	0.2	Negro
Ind.	73	103	81	14,831	105	150	66.9	1.1	32.0	96.6	3.1	Germany	0.3	Negro
Iowa	81	157	134	39,942	200	257	57.1	1.2	41.7	85.0	15.0	Germany	....	.....
Kans.	58	275	185	19,982	55	90	58.7	0.9	40.4	88.7	10.4	Germany	0.9	Negro
Ky.	54	80	52	5,587	49	95	66.3	0.4	33.4	95.0	0.4	Germany	4.6	Negro
La.	19	74	42	4,354	38	65	42.3	0.6	57.1	52.6	1.7	Italy	45.7	Negro
Maine	10	113	41	5,609	21	56	94.2	1.6	4.2	90.9	9.1	Canada	....	.....
Md.	49	99	66	9,678	55	82	68.5	2.6	28.9	84.0	3.3	Germany	12.7	Negro
Mass.	18	78	28	9,389	51	103	87.8	5.1	7.1	71.7	27.9	Canada	0.4	Negro
Mich.	35	97	66	8,976	50	80	81.1	1.2	17.7	75.0	24.6	Canada	0.4	Negro
Minn.	42	169	120	21,221	91	120	74.4	0.9	24.7	62.2	37.7	Sweden	0.1	Indian
Miss.	31	67	34	3,546	35	49	33.6	0.4	66.1	40.5	0.2	Italy	59.3	Negro
Mo.	57	132	94	13,654	75	110	70.4	0.9	28.8	95.4	3.2	Germany	1.4	Negro
Mont.	12	608	191	17,095	20	48	87.2	1.6	11.3	71.2	26.9	Norway	1.9	Indian
Nebr.	47	339	186	33,771	79	150	56.0	1.1	42.9	79.9	19.8	Germany	0.3	Indian
Nev.	1	745	188	31,546	25	110	85.3	5.3	9.4	65.2	28.0	Italy	6.8	Indian
N. H.	12	127	34	5,782	18	64	90.6	2.7	6.7	87.2	12.8	Canada	....	.....
N. J.	32	77	52	10,499	62	104	73.7	3.3	23.0	76.0	22.3	Italy	1.7	Negro
N. Mex.	2	818	58	10,896	8	60	86.3	1.5	12.2	88.9	4.6	Mexico	6.5	Indian
N. Y.	43	107	68	9,879	38	84	78.5	2.3	19.2	86.4	13.3	Germany	0.3	Indian
N. Car.	26	74	30	4,634	43	87	56.1	0.3	43.5	71.7	0.1	Germany	28.2	Negro
N. Dak.	55	466	316	22,651	35	49	73.3	1.1	25.6	52.7	46.7	Norway	0.6	Indian
Ohio.	71	92	72	12,060	86	132	69.3	1.2	29.5	93.8	5.5	Germany	0.7	Negro
Okla.	41	166	94	8,649	37	63	48.6	0.5	51.0	87.4	3.0	Germany	9.6	Negro
Ore.	8	270	98	16,304	43	130	79.4	1.8	18.8	80.5	18.3	Germany	1.2	Indian
Pa.	41	87	59	8,551	41	86	75.9	2.2	21.9	92.6	7.2	Germany	0.2	Negro
R. I.	19	81	33	8,238	44	105	79.5	5.0	15.5	76.5	23.0	Canada	0.5	Negro
S. Car.	32	65	32	4,946	52	82	35.1	0.4	64.5	43.4	0.1	Germany	56.5	Negro
S. Dak.	37	464	244	37,835	64	108	64.1	1.0	34.9	70.6	27.2	Germany	2.2	Indian
Tenn.	42	77	44	4,953	41	90	58.6	0.3	41.4	84.5	0.3	Italy	15.2	Negro
Texas.	2	262	72	10,200	28	72	46.1	0.6	53.3	75.0	6.8	Mexico	18.2	Negro
Utah.	3	197	67	12,130	42	135	88.0	1.2	10.9	83.0	15.5	England	1.5	Indian
Vt.	29	146	58	7,661	20	59	86.4	2.0	11.6	86.9	13.0	Canada	0.1	Negro
Va.	37	100	51	6,425	41	73	73.2	1.1	25.6	73.5	0.9	England	25.6	Negro
Wash.	16	200	108	15,952	60	150	79.5	1.8	18.7	68.3	29.8	Sweden	1.9	Japanese
W. Va.	36	110	63	5,687	32	75	82.6	1.2	16.2	98.5	0.9	Germany	0.6	Negro
Wis.	35	117	66	14,143	73	125	84.3	1.3	14.4	71.2	28.5	Germany	0.3	Indian
Wyo.	3	750	134	21,235	18	70	85.1	2.4	12.5	84.5	14.4	Germany	1.1	Indian

TABLE 11—WORLD: ANNUAL YIELD OF CROPS: SECTION I. CHIEF CROPS

Four-year average (1921–1922–1923–1924) except as noted. See note on Table A, page 507.

Continents and Countries	A Rice, Millions of Pounds	B Potatoes, Millions of Bushels	C Corn, Millions of Bushels	D Cotton, Thousands of Bales (478 lbs.)	E Wheat, Millions of Bushels	F Rye, Millions of Bushels	G Sugar, Thousands of Short Tons	H Oats, Millions of Bushels	I Tobacco, Millions of Pounds	J Barley, Millions of Bushels	K Flaxseed, Millions of Bushels	L Flax Fiber, Millions of Pounds	M Estimated Productivity‡
WORLD TOTAL	182,051.5	5.224.2	4,009.7	18,671.6	4,244.5	1,329.0	21,105.6	3,909.2	3,272.6	,1554.2	108.8	748.1	
AFRICA (TOTAL)	1,653.6	5.9	121.0	1,279.0	96.5	.7	571.9	19.4	59.2	89.6	.4	3.0	
Algeria	.....	2.1	.2	.7	24.7	.....	.....	11.1	33.5	33.1	.....	.4[9]	60
Angola	.....	.....	.....	1.8[13]									
Belgian Kongo	3.2[11]	.....	.....	5.0									
British East Africa	.6[13]	.....	.....	74.1	.....	.....	.....	.....	.....	.....	.03[8]	1.5[8]	
British West Africa	236.8[11]	.....	.....	19.1									
Egypt (Nile Valley)	314.2	.....	65.8[11]	1,134.0	37.1	.....	107.7	.....	.....	11.5	.....	1.1[9]	149
Eritrea	.....	.....	.....	.7									
French West Africa	153.0[8]	.....	.....	7.0[12]									
Madagascar	945.3[13]												
Mauritius	.....	.....	.....	.....	.....	.....	236.7						
Morocco	.....	.....	4.8[11]	.....	20.3	.....	.....	.4	.....	37.0	.3		
Mozambique	.....	.....	.....	2.6	.....	.....	59.5						
Nyasaland	.5[11]	.....	.....	3.3	.....	.....	.....	.....	5.2	.....	.....	.....	34
Rhodesia, etc. (So. Africa)[1]	.....	.1[12]	3.8	.....	.....	.....	.....	.....	3.3				
Somaliland (Italian)	.....	.....	.....	1.0[8]									
Sudan (British)	.....	.....	.....	26.8									
Tunis	.....	.1	.2	.....	7.3	.....	.....	2.4	.9	6.8	.03		
Union of South Africa	.....	3.6[12]	46.2[11]	3 1	6.9	.7[13]	168.1	5.5[12]	11.2[11]	1.2[17]			
ASIA (TOTAL)	176,944.5	276.2	164.5	6,088.2	1,098.0	.....	5,889.4	71.8	973.6	459.7	19.3	113.9	
Borneo (British)	30.5[12]	.....	.....	.2	.....	.....	.....	.....	1.2[11]				
Ceylon *	414.6	.....	.....	.1	.....	.....	.....	.....	10.0[9]				
China, proper	57,687.6[13]	.....	.....	1,875.8	(600.0)†	.....	.....	.....	.....	(200.0)†			
Chosen (Korea)	4,538.1	70.1[12]	2.7[12]	101.9	10.2	.....	.....	4.9[13]	29.8[12]	35.2	.....	1.1[8]	

				1.0	2.4[11]					2.0[11]			
Dutch East Indies[4]	9,062.1	.....	51.4	11.7[12]	.....	.....	1,555.1	.....	78.8				
Formosa	1,678.6	.....	.....	.....	.....	.....	390.7[8]	.....	3.5[11]				
India (Total)[2]	68,822.4[11]	.....	90.3[11]	3,815.1	338.5	.....	3,311.8	.....	570.0†	139.6[11]	17.0	.....	78
Indo-China (French)	7,684.2	.....	.....	12.6[12]									
Japan, proper	18,023.2	180.0[12]	3.9[12]	3.6[12]	27.5	.....	99.7[8]	11.8	140.2	77.0	.3	12.8	127
Java and Madura*	9,062.1	.....	51.4	.....	.....	.....	1,555.1	.....	78.8				
Malay States	149.1[13]												
Mesopotamia	.....	.....	.....	1.1									
Persia	.....	.....	.....	96.0[13]									
Philippine Islands	2,657.9	.....	16.4[11]	.....	.....	.....	532.2[8]	.....	84.9				
Russia in Asia	334.1[16]	26.1[9]	15.8[16]	119.3	94.3[17]	14	.....	55.1[9]	30.9[16]	6.0[9]	2.0†	100.0†	66
Siam	6,110.9[11]	.....	.....	2.7[12]									
Sumatra*	.....	.....	.....	.....	.....	.....	.....	.....	34.3				
Turkey	165.8[16]	.....	.....	.....	46.6[8]								
AUSTRALASIA (TOTAL)	7.1	18.2	7.8	4.9	134.8	.1	421.4	20.7	1.7	7.2	.2		
Australia	.....	13.9[12]	7.3[13]	4.9	127.3	.1[12]	351.8	14.6[8]	1.6[13]	6.0	.....	.....	70
New South Wales	.....	1.7	3.9	.....	40.0	.....	20.9	1.2	1.1†	.1			
Northern Territory													
Queensland	.....	.5	2.5	4.9	2.2	.....	330.9	.....	.1†	.1			
South Australia	.....	.5	.....	.....	30.7	.....	.....	1.7	.....	3.3			
Tasmania	.....	3.0	.....	.....	.5	.....	.....	1.5	.....	.2			
Victoria	.....	5.3	.9	.....	39.2	.....	.....	7.9	.4†	2.2			
Western Australia	.....	.5	.....	.....	14.7	.....	.....	2.2	.....	.1			
Fiji Islands	7.1[8]	.....	.....	.....	.....	.....	69.6	.....	.1[8]				
New Zealand	.....	4.3	.5	.....	7.5	.....	.....	6.1	.....	1.2[8]	.2[8]	.....	155

* Figures for these countries included in totals elsewhere.

† Estimated.

‡ In computing the productivity, or crop yield, the U. S. Department of Agriculture first obtains the average yield per acre of the chief crops for a series of years. It then reduces these yields to percentages of the standard yield for the crop in question, and averages these percentages, giving each crop a weight proportional to its importance in the given country. The United States with a productivity of 100 is reckoned as the standard. See Table 21 for similar data for the states of the United States.

TABLE 11—WORLD: ANNUAL YIELD OF CHIEF CROPS—*Continued*

Continents and Countries	A Rice, Millions of Pounds	B Potatoes, Millions of Bushels	C Corn, Millions of Bushels	D Cotton, Thousands of Bales (478 lbs.)	E Wheat, Millions of Bushels	F Rye, Millions of Bushels	G Sugar, Thousands of Short Tons	H Oats, Millions of Bushels	I Tobacco, Millions of Pounds	J Barley, Millions of Bushels	K Flaxseed, Millions of Bushels	L Flax Fiber, Millions of Pounds	M Estimated Productivity
EUROPE (TOTAL)	1,060.1	4,358.2	526.8	17.8	1,458.6	,1229.7	5,555.5	1,966.7	610.8	729.0	16.7	630.2	
Austria	.....	39.8[11]	2.9[11]	.....	7.9	14.5	42.7[6]	21.1[8]	.6[16]	6.6	.1[8]	7.1[8]	111[18]
Belgium	.....	101.8	.....	.....	12.8	20.1	337.9[6]	39.5	9.6	4.1	.4	52.5	204
Bulgaria	9.0	1.4	21.5	2.1	32.8	6.2	27.6[6]	8.1	54.9	9.4	.....	.4	81
Czechoslovakia	.....	237.3	9.9	.....	35.7	51.1	1,036.9[6]	80.6	6.5	49.2	.3	28.9	
Denmark	.....	47.8[11]	.....	.....	9.1[11]	13.7[11]	130.8[6]	56.1[11]	.....	28.8[11]	.....	.....	156
England and Wales	.....	116.0	.....	.....	59.4	.....	.....	97.3	.....	44.0	.....	.....	164[19]
Esthonia	.....	19.4[8]	.....	.....	.6[12]	6.0	.....	9.5	.....	5.3	.4	21.3	
Finland	.....	18.7	.....	.....	.6	10.7	1.3[6]	31.5	.....	5.6	.....	3.3[8]	
France	2.0[16]	430.8	13.5	.....	281.2	39.8	543.6[16]	291.4	55.9	42.5	.3[8]	22.7[8]	114
Germany	.....	1,246.9	.....	.....	94.8	243.2	1,500.5[6]	366.2	43.5	95.3	.....	.....	157
Greece	.....	.....	8.0[12]	9.0	11.0	.....	.....	4.6[12]	92.7[11]	6.5[12]			
Hungary	.....	53.4	52.4	.....	56.4	25.6	128.2[6]	22.3	40.0[11]	21.5	.05[8]	5.4[8]	105
Ireland[5]	.....	96.2[11]	.....	.....	1.4[11]	.....	.....	59.9	.....	6.6[11]	.....	13.5[8]	
Italy	632.7	57.6[11]	89.2	4.9[17]	187.6	6.2	318.8[6]	35.5	47.7[11]	9.7	.4	5.4	89
Latvia	.....	25.1	.....	.....	1.2	9.3	.....	18.6	.....	7.0	.7	41.5	
Lithuania	.....	62.5	.....	.....	3.1	22.0	.....	23.6	.....	8.8	1.2	59.0	
Luxemburg	.....	5.8	.....	.....	.3	.4	.....	2.0	.....	.2			
Netherlands	.....	114.6	.....	.....	6.3	16.1	325.7[6]	19.5	.....	3.1		13.3	176
Norway	.....	28.7	.....	.....	.7	.8	.....	12.2	.....	4.4	.....	.....	118
Poland	.....	953.9	2.5[11]	.....	40.6	187.6	375.0[6]	186.4	.....	62.0	2.1	105.9	
Portugal	24.0[11]	6.1[12]	11.2[12]	.....	10.2	5.3	.....	8.0	.....	2.2	.....	.....	68
Rumania	.....	44.4[11]	143.6	.....	86.8	8.4	65.0[6]	66.4	28.8[11]	66.3[8]	.2[8]	.9[9]	87
Russia (European)	1.2[1c]	391.1[9]	59.3[8]	.....	307.7[17]	486.2[9]	303.9[6]	330.7[9]	199.2[16]	121.8[9]	10.3[8]	227.8[8]	67
Scotland	.....	36.4	.....	.....	2.5[8]	.....	.....	46.2[8]	.....	6.0[8]			
Spain	339.8	98.1	25.0	.9[9]	137.7	27.8	193.2[7]	33.0	.....	85.3	.05[8]	1.3[8]	86

Sweden	.....	64.7	.....	.....	10.0	21.4	165.2[6]	74.4	1.3[8]	12.6	.....	.9[9]	126
Switzerland	.....	24.4	.2	.....	3.1	1.5	6.7[6]	2.8	.8[8]	.5	.....	.....	187
Yugoslavia	3.3[11]	35.3[11]	87.8	.9	56.9	5.8	52.7[6]	19.5	30.1[8]	13.5	.....	17.1[8]	70[20]
North America (Totals)	1,084.8	520.0	2,967.4	10,504.0	1,213.8	95.8	7,390.1	1,771.8	1,422.8	255.5	22.9		
Canada[3]	.....	97.4	13.1	.....	361.6	22.9	24.6[6]	476.3	27.2[11]	74.9	6.5	.....	126
Cuba	.....	.....	.....	.....	.....	.....	4,583.4	.....	63.8[13]				
Dominican Republic	.....	.....	.....	.4	.....	.....	229.8	.....	19.5				
Guatemala	3.6[8]	.....	6.3[8]	.2	.....	.....	26.3	.....	.2[8]				
Haiti	.....	.....	.....	15.5	.....	.....	9.5						
Hawaii	22.0[15]	.....	.....	.....	.....	.....	621.0						
Jamaica	.....	.....	.....	.....	.....	.....	39.5	.....	.5[16]				
Mexico	26.4[13]	1.1	88.1	162.9	14.1[12]	.....	169.4	.....	22.9[13]	.....	.....	.....	48
Porto Rico	3.8[15]	.....	.....	1.4[12]	.....	.....	439.3	.....	20.2[8]				
Salvador	10.3[13]	.....	.....	.....	.....	.....	35.5[8]						
United States[3]	1,018.7	421.5	2,866.2	10,323.8	838.1	72.9	1,186.0[7]	1,285.5	1,268.6	130.7	16.4	.....	100
South America (Totals)	1,301.4	45.7	222.3	777.7	242.6	2.7	1,277.3	58.8	204.5	13.3	49.3	.9	69
Argentina	16.5[17]	33.5[8]	214.9	35.7	206.0	2.6	250.5	53.8	28.2	6.7	48.7		
Brazil	1,150.7	.....	.....	536.7	.....	.....	563.6	.....	168.0[11]	.....	.....		
British Guiana	55.2	.....	.....	.....	.....	.....	105.2						
Chile	.....	12.0	1.8	.....	25.0	.1	.....	3.0	7.6[12]	6.5	.....	.9[10]	126
Dutch Guiana	11.4[11]	.....	.....	.....	.....	.....	12.2						
Paraguay	.....	.....	.....	6.5	.....	.....	2.7[8]						
Peru	67.6	.....	.....	182.5	2.7[8]	.....	343.3						
Uruguay	.....	.2	5.6	.....	8.8	.....	.....	2.0	.8	.1	.7[8]	.....	65

[1] Includes Basutoland, Bechuanaland, Rhodesia, and Swaziland.
[2] Including Ceylon.
[3] See Table 15 for data for states.
[4] Including Java and Madura.
[5] Including Irish Free State and Northern Ireland.
[6] Beet sugar.
[7] Spain: beet sugar 181,000 short tons; cane sugar 12,200 short tons. United States: beet sugar 963,500 short tons; cane sugar 222,500 short tons.
[8] Three-year average during 1921–1924.
[9] Two-year average during 1921–1924.
[10] Data for one year.
[11] Data for 1920–1923.
[12] Four-year average during 1918–1924.
[13] Three-year average during 1918–1924.
[14] Included with European Russia.
[15] Average of 1900 and 1919.
[16] Average 1909–1913.
[17] Average 1909–1913 and last two available years.
[18] Old boundaries before the war.
[19] United Kingdom of Great Britain and Ireland.
[20] Old Serbia.

TABLE 11 (SECTION II)—YIELD OF MINOR CROPS

(1923 or Latest Available Year, Unless Otherwise Specified)

Continent and Country	A Hay and Forage Area, Average, 1922–3, Thousands of Acres	B Hay, Thousands of Short Tons	C Wine, Average, 1920–3, Thousands of Hectoliters	D Grapes,[1] Millions of Pounds. Coconuts and Palm Oil,[1] Long Tons	E Beans,[2] Thousands of Bushels. Rubber,[2] Thousands of Pounds	F Coffee,[3] 1923–4, Millions of Pounds. Apples,[3] Millions of Bushels	G Tea,[4] Millions of Pounds. Peas,[4] Thousands of Bushels	H Olives, Millions of Pounds	I Peanuts, Short Tons	J Silk Yield of Cocoons. Thousands of Pounds
WORLD										
AFRICA:										
Algeria	62	61	7,358	.....	1,132	.....	.....	224	.....	2
Angola	.....	.....	.....	.....	375[2]					
Belgian Kongo	.....	.....	.....	7,504[1]	1,746					
British East Africa	.....	.....	.....	.....	.....	22				
British West Africa	.....	.....	.....	53,505[1]	297[2]					
Egypt	1,560	.....	75[13]	35[13]	10,283	.....	.....	.....	14,881	
French West Africa	.....	.....	.....	9,247[1]	32[2]	.....	.....	.....	382,256	
Madagascar	.....	.....	.....	.....	.....	6				
Mauritius	.....	.....	.....	154[1]						
Morocco	2	.....	40	.....	.....	.....	.....	100	.....	2
Nyasaland	.....	.....	.....	.....	.....	.....	1			
Rhodesia	.....	.....	.....	.....	.....	.....	[Tripoli	8]	1,063	
Tunis	74	.....	395	10[8]	.....	.....	.....	222		
Union of South Africa	302	.....	689	.....	.....	.....	1	.....	6,000	
ASIA:										
Aden	.....	.....	.....	.....	.....	13				
Ceylon	.....	.....	.....	24,236[1]	91,689[2]	.....	182			
China	.....	.....	.....	.....	(?)	.....	800	.....	.....	1,750,000[7]
Chosen	.....	.....	.....	1[7]	14,240	.....	.....	.....	479	17,200
Cyprus	.....	.....	.....	105[9]	.....	.....	.....	8	.....	342

Dutch East Indies	.....	.....	.....	38,057[1]	246,641[2]	119	.....	.....	275,716	
Formosa	.....	.....	.....	.....	657	.....	24	.....	19,489	89
India (Total)	11,300	.....	.....	6,526[1]	71,701	20	375	.....	1,207,360	
Indo-China (French)	.....	.....	.....	755[1]	9,120[2]	1	[79 J	apan]	.....	13,000[7]
Japan	.....	.....	16[13]	100[1]	23,998	.....	2,736[4]	.....	18,320	575,000
Java and Madura	.....	.....	[Japan	51[13]]	.....	.....	91			
Malay States	.....	.....	.....	.....	147,889[2]					
Palestine	.....	.....	27[13]	15[13]	.....	.....	.....	2		
Philippine Islands	.....	.....	.....	88,865[1]	.....	2				
Russia in Asia	.....	.....	903[13]	519[13]	225	.....	794[4]	.....	.....	22,700[12]
Straits Settlements	.....	.....	.....	9,792[1]	55,446[2]	.....	.....	.....	.....	
Syria	.....	.....	25[13]	325[13]	.....	.....	.....	256	.....	10,600[11]
AUSTRALASIA:										
Australia	8,140	.....	470[13]	1,290[1]	43	6[3]	815[4]			
Fiji Islands	.....	[Austr	alia	410[13]]						
New Zealand	17,450	.....	3	.....	.....	1[3]	369[4]			
EUROPE:										
Austria	3,480	3,557	613	.....	85	.....	59[4]			
Belgium	2,000	3,062	.....	.....	604	.....	390[4]			
Bulgaria	1,210	603	779[13]	359[13]	1,895	.....	.....	.....	.....	2,860
Czechoslovakia	6,800	4,651	428	.....	.....	13[3]				
Denmark	4,175	1,990[7]	.....	.....	1,357					
Esthonia	3,020									
Finland	3,730	2,086								
France	46,100	36,227	60,969	175[8]	8,250	100[3]	515[4]	.....	.....	7,340
Germany	22,000	30,186	2,173	.....	.....	100[3]				
Great Britain and North Ireland	13,700	8,642	.....	.....	7,870	.....	3,548[4]			
Greece	.....	.....	1,925	323[9]	.....	.....	.....	1,180[7]		
Hungary	1,770	.....	3,802	.....	599	.....	427[4]			

[1] Figures in this column with note [1] are for long tons of coconut and palm oils.

[2] Figures in this column with note [2] are for thousands of pounds of rubber.

[3] Figures in this column with note [3] are for millions of bushels of apples.

[4] Figures in this column with note [4] are for thousands of bushels of peas.

[5] Partly pasture.

[6] Artificial pasture.

[7] Estimated (China very doubtful).

[8] Table grapes.

[9] Table grapes and raisins.

[10] Exports.

[11] Includes 6600 for Syria and Lebanon, and estimate of 4000 for Turkey.

[12] Pre-war figure, now insignificant.

[13] Wine grapes apparently included in column D. Elsewhere in column C a hectoliter of wine is roughly equivalent to 450 lbs. of grapes.

TABLE 11 (SECTION II)—YIELD OF MINOR CROPS—*Continued*

Continent and Country	A Hay and Forage Area, Average, 1922–3, Thousands of Acres	B Hay, Thousands of Short Tons	C Wine, Average, 1920–3, Thousands of Hectoliters	D Grapes,[1] Millions of Pounds. Coconuts and Palm Oil,[1] Long Tons	E Beans,[2] Thousands of Bushels. Rubber,[2] Thousands of Pounds	F Coffee,[3] 1923–4, Millions of Pounds. Apples,[3] Millions of Bushels	G Tea,[4] Millions of Pounds. Peas,[4] Thousands of Bushels	H Olives, Millions of Pounds	I Peanuts, Short Tons	J Silk Yield of Cocoons. Thousands of Pounds
EUROPE—*Continued.*										
Irish Free State	276	.....	.....	.....	75	.....				
Italy	5,660	8,051	40,835[13]	16,770[13]	12,452	10[3]	625[4]	2,324	.....	93,600
Latvia	4,740[5]									
Netherlands	3,330[5]	.....	.....	.....	2,095	.....	2,932[4]			
Norway	1,555	2,016								
Poland	1,610	.....	.....	.....	2,689	.....	1,796[4]			
Portugal	.....	.....	4,088	.....	.....	.....	.....	320[7]		
Rumania	1,075	1,224	4,345	.....	870	.....	247[4]	.....	.....	467
Russia (European)	.....	.....	737[13]	621[13]	6,027	.....	.....	.....	.....	314
Spain	6,200	2,200[7]	23,431[13]	7,465[13]	13,661	.....	8,143[4]	3,227	23,560	
Sweden	5,060	4,494	.....	.....	120	.....	2,094[4]			
Switzerland	.....	.....	.....	.....	.....	5[3]	.....	.....	.....	47
United Kingdom										
Yugoslavia	4,570	2,193	3,809	.....	.....	7[3]	.....	45[7]		
NORTH AMERICA:										
Canada	12,700	16,841	45	.....	1,265	27[8]	3,528[4]			
Costa Rica	276[6]	.....	.....	.....	.....	32[10]				
Dominican Republic	.....	.....	.....	.....	.....	3[10]				

Guatemala	.....	.....	.....	.....	.....	74				
Haiti	.....	.....	.....	.....	.....	53				
Hawaii	.....	.....	.....	.....	.....	18				
Honduras	.....	.....	.....	.....	.....	3				
Jamaica	.....	.....	.....	.....	.....	8				
Mexico	.....	.....	8	.....	4,858	41	.....	.....	1,443	
Nicaragua	.....	.....	.....	.....	.....	32[10]				
Panama	.....	.....	.....	.....	.....	2				
Porto Rico	.....	.....	.....	.....	.....	39				
Salvador	.....	.....	.....	.....	.....	120				
United States	103,000	99,173	.....	2,283	9,077	180[3]	10,000[4?]	16	308,100	
SOUTH AMERICA:										
Argentina	20,300	.....	4,077[13]	1,506[13]	.....	.....	.....	.....	40,570	
Bolivia	.....	.....	.....	.....	4,802[2]					
Brazil	.....	.....	443	75[1]	40,672[2]	1,754				
British Guiana	.....	.....	.....	66[1]						
Chile	2,745	386	(?)2,141	14[9]	.....	.....	429[4]	3		
Columbia	.....	.....	.....	.....	.....	216				
Dutch Guiana	.....	.....	.....	.....	.....	5				
Ecuador	.....	.....	.....	.....	1,300[2]	4[10]				
French Guiana	.....	.....	.....	.....	621[2]					
Paraguay	.....	.....	.....	9[1]	.....	.....	.....	.....	10.725	
Uruguay	.....	.....	315[13]	110[13]	.....	.....	.....	1		
Venezuela	.....	.....	.....	.....	2,500[2]	108[10]				

[1] Figures in this column with note [1] are for long tons of coconut and palm oils.

[2] Figures in this column with note [2] are for thousands of pounds of rubber.

[3] Figures in this column with note [3] are for millions of bushels of apples.

[4] Figures in this column with note [4] are for thousands of bushels of peas.

[5] Partly pasture.

[6] Artificial pasture.

[7] Estimated (China very doubtful).

[8] Table grapes.

[9] Table grapes and raisins.

[10] Exports.

[11] Includes 6600 for Syria and Lebanon, and estimate of 4000 for Turkey.

[13] Wine grapes apparently included in column D. Elsewhere in column C a hectaliter of wine is roughly equivalent to 450 lbs. of grapes.

TABLE 12—WORLD: PRODUCTION OF CHIEF CROPS PER 1000 PEOPLE, YIELD PER ACRE AND YIELD PER SQUARE MILE (Based on Four-year Average, 1921–1924, or Nearest Available Years)

SECTION I—POTATOES, WHEAT, OATS AND BARLEY

Continent and Country	Potatoes			Wheat			Oats			Barley		
	A Yield per 1,000 People (Bu.)	B Yield per Acre (Bu.)	C Yield per Square Mile (Bu.)	D Yield per 1,000 People (Bu.)	E Yield per Acre (Bu.)	F Yield per Square Mile (Bu.)	G Yield per 1,000 People (Bu.)	H Yield per Acre (Bu.)	I Yield per Square Mile (Bu.)	J Yield per 1,000 People (Bu.)	K Yield per Acre (Bu.)	L Yield per Square Mile (Bu.)
World												
Africa:												
Algeria	206	44.2	5	4,270	.....	111	1,910	19.2	50	5,700	12.0	149
Egypt	.....	.....	.....	2,760	25.0	3,040	.....	.....	.....	855	29.8	952
Morocco	.....	.....	.....	3,390	9.2	92	67	14.2	.....	26,160	13.7	17
Rhodesia	40	41.8										
Tunis	95	62.3	4	3,460	5.4	150	1,145	18.3	50	3,245	6.3	141
Union of South Africa	533	61.3	8	995	9.2	15	794	9.7	12	175	12.4	3
Asia:												
Chosen	1,000	98.3	206	590	11.8	121	284	18.9	58	2,040	16.4	419
Cyprus	.....	.....	.....	7,720	13.6	667	.....	.....	.....	6,420	17.5	556
India	.....	.....	.....	1,190	11.6	210	.....	.....	.....	429	19.7	76
Japan	845	141.4	326	476	22.7	185	208	41.6	79	1,335	28.3	517
Russia in Asia	929	98.6	4	8,780	8.4	15	1,795	18.5	.....	194	9.9	1
Australasia:												
Australia	2,040	96.6	4	22,600	13.5	43	2,595	21.3	5	1,065	21.8	2
New South Wales	812	69.3	.....	19,000	13.0	129	570	15.6	4	48	14.7	
Northern Territory												
Queensland	660	59.0	1	2,900	14.2	3	.....	.....	.....	132	16.4	
Southern Australia	1,015	108.3	1	62,000	13.1	81	3,435	10.6	5	6,670	17.9	9
Tasmania	14,020	91.3	115	2,340	20.6	19	7,000	28.1	57	935	23.8	8
Victoria	3,460	72.0	60	25,600	15.7	445	5,045	18.0	90	1,432	22.9	25
Western Australia	1,502	123.3	1	45,200	10.1	15	6,620	11.6	.....	300	11.4	
New Zealand	3,400	209.2	41	5,920	29.0	72	4,810	45.3	59	946	36.1	12

EUROPE:												
Austria	6,200	111.6	1,290	1,230	17.7	453	3,280	29.0	685	1,027	20.8	240
Belgium	13,680	248.3	8,720	1,715	38.4	1,095	5,280	60.4	3,380	549	49.0	350
Bulgaria	288	62.2	34	6,750	14.3	805	1,662	22.7	199	1,930	18.5	231
Czechoslovakia	17,400	149.9	4,360	2,620	23.0	658	5,920	39.5	1,480	3,610	30.7	906
Denmark	14,500	226.1	2,800	2,760	43.5	532	17,020	50.5	3,280	8,745	44.0	1,682
England and Wales	3,060	227.1	1,985	1,565	32.6	1,020	2,568	46.9	1,665	1,160	32.4	763
Esthonia	17,480	150.6	1,182	540	13.9	33	8,560	24.5	516	4,680	17.2	288
Finland	5,500	111.5	125	177	16.3	4	9,250	29.9	210	1,650	20.1	37
France	11,000	117.9	2,022	7,200	21.1	1,320	.....	34.3	1,368	1,081	25.1	200
Germany	20,830	185.7	6,850	1,590	26.6	520	6,130	44.6	2,020	1,590	31.3	521
Greece	.....	.....	.....	1,850	11.5	224	772	29.7	93	1,092	16.9	132
Hungary	6,700	83.5	1,490	7,100	17.2	1,580	2,805	27.2	622	2,705	17.8	600
Ireland	21,820	169.7	2,940	320	32.2	43	15,000	48.2	1,840	1,652	37.3	202
Italy	1,480	71.5	480	4,820	16.3	1,560	912	29.3	296	250	17.4	81
Latvia	13,540	146.0	988	650	15.5	47	10,200	26.0	730	3,780	17.3	376
Lithuania	13,000	174.5	1,046	645	16.1	52	4,910	29.9	403	1,830	20.2	148
Netherlands	16,460	264.0	8,700	903	41.3	478	2,795	50.9	1,476	444	51.7	235
Norway	10,900	239.2	230	267	23.6	6	4,660	42.5	98	1,670	32.9	35
Poland	35,100	175.4	6,380	1,500	16.6	272	6,860	32.0	1,245	2,285	22.2	415
Portugal	1,010	110.2	172	1,850	9.5	287	1,325	18.5	225	364	14.0	62
Rumania	2,740	119.6	391	5,350	13.0	765	4,080	20.7	583	4,070	14.4	582
Russia (European)	3,725	110.6	217	3,000	8.7	170	3,230	19.0	.....	1,186	12.5	67
Scotland	7,450	246.9	1,200	510	39.2	82	9,450	46.7	1,520	12,290	37.2	198
Spain	4,570	125.1	504	6,450	13.3	706	1,540	21.6	169	3,980	21.2	437
Sweden	10,800	167.8	374	1,675	28.5	58	12,420	41.1	429	2,105	30.7	73
Switzerland	6,280	208.7	1,535	800	26.9	195	.....	55.2	176	129	33.2	31
Yugoslovia	2,940	67.9	368	4,730	14.8	592	1,620	20.3	203	1,121	16.9	140
NORTH AMERICA:												
Canada	10,840	155.7	36	40,200	15.9	97	54,200	32.5	130	8,350	25.8	20
Mexico	76	?	1	975	10.8	18						
United States	3,820	107.6	142	7,200	14.1	282	10,800	30,4	432	1,632	24.4	60
SOUTH AMERICA:												
Argentina	3,860	91.6	29	23,800	12.6	181	6,200	23.5	47	722	13.1	6
Chile	3,160	143.7	42	6,550	18.4	86	786	39.3	10	1,702	48.6	22
Peru	.....	.....	.....	379	12.9	5						
Uruguay	131	25.1	3	5,750	10.7	122	1,308	15.8	28	65	14.0	1

TABLE 12 (SECTION II)—CORN, RYE, TOBACCO, FLAX

Continent and Country	Corn			Rye			Tobacco			Flax			
										Yield per 1,000 People		Yield per Square Mile	
	Yield per 1,000 People (Bu.) A	Yield per Acre (Bu.) B	Yield per Square Mile (Bu.) C	Yield per 1,000 People (Bu.) D	Yield per Acre (Bu.) E	Yield per Square Mile (Bu.) F	Yield per 1,000 People (Pounds) G	Yield per Acre (Pounds) H	Yield per Square Mile (Pounds) I	Seed (Bu.) J	Fiber (Pounds) K	Seed (Bu.) L	Fiber (Pounds) M
WORLD													
AFRICA:													
Algeria	34	13.1	1				6,620	763	174		69*		2*
British East Africa										15	3*	0.23	
Egypt	4,880	33.3	5,390								82*		91*
Morocco	800	8.3	23								50	1.4	
Nyasaland							4,330		131				
Rhodesia, etc. (South Africa)	1,505	18.4	5				1,308						
Tunis	91	4.9	4				430		19		14	0.6	
Union of South Africa	6,660	9.9	98	102			11,618		24				
ASIA:													
Borneo (British)							4,650		39				
Ceylon							2,220		389				
Chosen	156	12.7	32				1,730	757	354		64*		13*
Formosa							956		254				
India (Total)	278	14.4	49				1,752		312		52	9.3	
Japan, proper	69	27.0	26				2,480	1,483	1,052	5	226*	2.0	86*
Java and Madura	1,460	12.5	1,016				2,215		1,560				
Philippine Islands	1,500	12.1	143				7,790	472	748				
Russia in Asia	510	13.0	2				1,000		5	65	3,235*		15*
Sumatra							5,870		214				
AUSTRALASIA:													
Australia	1,296	25.6	2	18	12.8		284		1				
New South Wales	1,986	27.4	13				524		4				
Northern Territory													
Queensland	3,300	19.5	4				132						
South Australia													
Tasmania													
Victoria	587	39.2	10				260		5				
West Australia													
Fiji Islands							645		14				
New Zealand	394	46.9	5		21.0						158	2	

EUROPE:													
Austria	452	22.7	94	2,260	16.9	470	93	.....	19	16	1,104	3	230*
Belgium	.....	.....	.....	2,690	36.0	1,720	1,286	.....	870	54	7,030	33	4,490*
Bulgaria	4,420	15.4	527	1,272	14.2	152	11,290	699	1,350	.....	.....	.....	10*
Czechoslovakia	726	25.3	182	3,760	23.9	942	477	.....	119	22	2,120*	5.5	532*
Denmark	.....	.....	.....	4,160	24.5	800	.....	.....	.....	.....	.....	.....	.....
Esthonia	.....	.....	.....	5,410	15.6	326	.....	.....	.....	361	19,200*	21.7	1,155*
Finland	.....	.....	.....	3,140	18.5	71	.....	.....	.....	.....	970*	.....	22*
France	344	16.4	63	1,012	18.1	187	1,420	1,576	262	8	578	1.4	106*
Germany	.....	.....	.....	4,070	23.3	1,352	727	2,006	238	.....	.....	.....	.....
Greece	1,344	16.7	163	.....	.....	.....	15,600	921	1,883	.....	.....	.....	.....
Hungary	6,580	21.7	1,462	3,220	16.5	715	5,035	838	1,118	6	680*	1.4	151*
Ireland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	85*
Irish Free State	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Italy	2,295	23.7	741	160	19.4	52	1,230	896	397	1	139*	0.3	45*
Latvia	.....	.....	.....	5,020	15.1	368	.....	.....	.....	378	22,400*	37.6	1,636*
Lithuania	.....	.....	.....	4,580	16.4	376	.....	.....	.....	250	12,290*	20.5	990*
Netherlands	.....	.....	.....	2,310	30.6	1,219	.....	.....	.....	43	1,910*	2.3	1,007*
Northern Ireland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	8,350*	.....	2,000*
Norway	.....	.....	.....	320	27.7	6	.....	.....	.....	.....	.....	.....	.....
Poland	92	15.7	17	6,900	17.7	1,250	.....	.....	.....	77	3,900*	14.1	709*
Portugal	1,858	15.9	316	879	8.5	149	.....	.....	.....	.....	.....	.....	.....
Rumania	8,850	16.8	1,262	516	12.4	74	1,770	561	254	12	178*	1.7	25*
Russia (European)	578	15.4	33	4,750	10.5	269	1,941	.....	110	100	2,220*	5.7	126*
Spain	1,175	21.5	128	1,300	14.9	143	.....	.....	.....	2	61*	0.3	7*
Sweden	.....	.....	.....	3,510	25.3	123	217	.....	8	.....	150*	.....	5*
Switzerland	51	42.6	13	486	30.7	94	206	.....	50	.....	.....	.....	.....
Yugoslavia	7,300	17.7	915	482	13.0	60	2,500	703	313	.....	1,420*	.....	178*
NORTH AMERICA:													
Canada	1,460	41.1	4	2,550	17.3	6	3,025	.....	7	725	.....	1.7	.....
Cuba	.....	.....	.....	.....	.....	.....	22,060	.....	1,445	.....	.....	.....	.....
Dominican Republic	.....	.....	.....	.....	.....	.....	21,660	.....	1,020	.....	.....	.....	.....
Guatemala	3,145	15.8	145	.....	.....	.....	100	.....	5	.....	.....	.....	.....
Jamaica	.....	.....	.....	.....	.....	.....	576	.....	111	.....	.....	.....	.....
Mexico	6,100	21.8	115	.....	.....	.....	1,585	.....	30	.....	.....	.....	.....
Porto Rico	.....	.....	.....	.....	.....	.....	15,000	569	5,940	.....	.....	.....	.....
United States	25,870	27.6	965	659	14.1	24	11,470	754	432	148	.....	5.5	.....
SOUTH AMERICA:													
Argentina	24,800	26.9	189	300	10.5	2	3,240	.....	25	5,620	.....	43	.....
Brazil	.....	.....	.....	.....	.....	.....	5,470	.....	53	.....	.....	.....	.....
Chile	472	24.2	6	26	16.4	.....	1,992	.....	26	236*	.....	.....	3*
Uruguay	3,660	9.7	78	.....	.....	.....	522	.....	11	458	.....	9.7	.....

* Flax Fiber.

TABLE 12 (SECTION III)—RICE, COTTON, AND SUGAR

Continent and Country	Rice			Cotton			Sugar	
	A	B	C	D	E	F	G	H
	Yield per 1,000 People, Pounds	Yield per Acre, Pounds	Yield per Square Mile, Pounds	Yield per 1,000,000 People, Bales	Yield per Acre, Pounds	Yield per 1000 Square Miles, Bales	Yield per 1,000 People, Short Tons	Yield per Square Mile, Short Tons
WORLD								
AFRICA:								
Algeria	.....	.....	.....	121	.....	3		
Angola	.....	.....	.....	438	.....	4		
Belgian Kongo	214	200	4	333	.....	5		
British East Africa	61	.....	1	7,500	111	103		
British West Africa	10,370	612	490	835	.....	40		
Egypt	23,400	1,495	25,800	84,500	322	93,000	8.0	8.8
Eritrea	.....	.....	.....	15,560	.....	15		
French West Africa	12,500	254	9	583	.....	4		
Madagascar	270,000	813	4,150					
Mauritius	.....	.....	.....	.....	.....	.....	631.0	296.0
Morocco								
Mozambique	.....	.....	.....	834	.....	6	19.1	0.14
Nyasaland	415	?	13	2,835	.....	834		
Somaliland (Italian)	.....	.....	.....	1,540	.....	7		
Sudan (British)	.....	.....	.....	4,580	155	26		
Union of South Africa	.....	.....	.....	457	.....	7	24.2	0.36
ASIA:								
Borneo (British)	118,000	637	980	775	.....	6		
Ceylon	91,800	509	16,200	22	.....	4		
China	132,000	.....	37,500	4,300	220	1,226		
Chosen	252,000	1,234	53,900	5,920	132	1,211		
Cyprus	.....	.....	.....	5,150	.....	445		
Dutch East Indies	192,000	1,150	12,380	250	.....	16		
Formosa	460,000	1,142	121,500	.....	.....	.....	106.8	29.4
India (Total)	212,000	855	37,500	11,760	86	2,075	10.2	1.08
French	121,000	718	160,000					
Indo-China (French)	405,000	658	28,950	665	.....	46		
Japan, proper	322,000	2,340	121,500	62	.....	24	1.7	0.7
Java and Madura	259,000	1,061	179,000	.....	.....	.....	442.2	306.5
Malay States	61,000	646	2,930					
Mesopotamia	.....	.....	.....	386	.....	8		
Persia	.....	.....	.....	10,100	.....	153		
Philippine Islands	246,000	642	23,050	.....	.....	.....	48.7	4.6
Russia in Asia	10,800	584	99	3,860	122	19		
Siam	656,000	959	31,400	290	.....	14		
Turkey	11,400	1,099	588	3,200	.....	171		

Australia	.....	.....	.....	870	.....	2	62.4	0.12
New South Wales	.....	.....	.....	.....	.....	.....	10.0	0.07
Queensland	.....	.....	.....	6,460	.....	7	435.0	0.49
Fiji Islands	45,800	627	1,000	.....	.....	.....	450.0	9.7
EUROPE:								
Austria	.....	.....	.....	.....	.....	.....	6.6	1.9
Belgium	.....	.....	.....	.....	.....	.....	45.2	28.9
Bulgaria	1,850	1,395	200	432	.....	52	5.7	0.68
Czechoslovakia	.....	.....	.....	.....	.....	.....	75.9	19.1
Denmark	.....	.....	.....	.....	.....	.....	400.0	7.6
Finland	.....	.....	.....	.....	.....	.....	.....	0.09
France	51	.....	9	.....	.....	.....	13.8	2.6
Germany	.....	.....	.....	.....	.....	.....	25.1	8.2
Greece	.....	.....	.....	1,510	.....	183	.....	
Hungary	.....	.....	.....	.....	.....	.....	16.1	3.6
Italy	17,600	2,248	5,680	126	.....	41	8.2	2.7
Netherland	.....	.....	.....	.....	.....	.....	46.6	24.6
Poland	.....	.....	.....	.....	.....	.....	13.8	2.5
Portugal	3,970	1,449	685	.....	.....	.....	.....	
Rumania	.....	.....	.....	.....	.....	.....	4.0	0.6
Russia	12	609	1	.....	.....	.....	3.0	0.2
Spain	15,900	3,214	1,740	42	.....	5	9.1	1.0
Sweden	.....	.....	.....	.....	.....	.....	27.6	1.0
Switzerland	.....	.....	.....	.....	.....	.....	1.7	0.4
Yugoslavia	274	668	34	75	.....	9	4.4	0.5
NORTH AMERICA:								
Canada	.....	.....	.....	.....	.....	.....	2.7	
Costa Rico	.....	.....	.....	.....	.....	.....	12.4	0.3
Cuba	.....	.....	.....	.....	.....	.....	1,584.0	104.0
Dominican Republic	.....	.....	.....	447	.....	21	255.5	11.9
Guatemala	1,800	442	83	100	.....	5	13.1	0.6
Haiti	.....	.....	.....	9,690	.....	1,400	5.8	0.9
Hawaii	73,500	2,900	3,440	.....	.....	.....	2,800.0	97.0
Jamaica	.....	.....	.....	.....	.....	.....	45.5	8.8
Mexico	1,820	824	34	11,260	308	213	11.7	0.2
Nicaragua	.....	.....	.....	.....	.....	.....	20.1	0.3
Panama	.....	.....	.....	.....	.....	.....	92.3	0.1
Porto Rico	2,820	272	1,120	1,040	.....	411	326.0	129.0
Salvador	6,770	972	780	.....	.....	.....	23.3	2.7
United States	9,220	1,082	342	93,600	144	3,480	10.7	0.4
SOUTH AMERICA:								
Argentina	1,900	1,293	15	4,110	214	31	28.8	0.2
Brazil	37,500	1,952	366	17,450	185	170	18.3	0.2
British Guiana	185,500	1,110	615	.....	.....	.....	352.5	1.2
Dutch Guiana	100,000	?	247	.....	.....	.....	117.9	0.3
Ecuador	.....	.....	.....	3,150	.....	53		
Paraguay	.....	.....	.....	6,500	.....	67	2.7	
Peru	9,250	997	127	25,000	.....	342	47.3	0.6
Venezuela	.....	.....	.....	4,150	.....	25		

TABLE 13.—WORLD. TOTAL NUMBER OF ANIMALS, 1923

(See note on Table A, page 507)

Continent and Country	Year	Horses, Thousands	Mules, Thousands	Asses, Thousands	Cattle, Thousands	Swine, Thousands	Sheep, Thousands	Goats, Thousands	Poultry, Thousands	Camels, Thousands	Animal Units: Total	Animal Units: Per Capita	Animal Units: Per Square Mile	Animal Units: Surplus or Deficiency per Square Mile	Milk, Approximate Millions of Gallons
		A	B	C	D	E	F	G	H	I	J	K	L	M	N
Africa (Totals)	....	4‡ 2,054	436	3,268	43,238†	1,853	68,497[3]	34,312[3]	25,463	1,086*					
Algeria	1923	195	174	269	1,022	111	8,991	3,768	1/2	197	26,243	4.5	118	31	
Belgian Congo	1922	.....	.....	.....	500	50	300	500	1/50	.....	3,375	0.2	4	−50	
British East Africa	1923	2	1	61	7,910	14[2]	4,454	6,543	34	150	50,436	5.7	70	31	
British South West Africa	1923	21	2	36	550	6	937	924	1/20	.....	4,550	19.2	14	11	
British West Africa	1922	174	.....	451	3,023	82	2,869	4,574	1/20	4	23,553	1.1	52	−103	
Cameroon (French)	1922	15	.....	.....	290	.....	298	.....	1/50	.....	1,951	1.3	12	−18	
Egypt	1923	37	22	603	1,291†	.....	962	401	1/2	141	12,864	1.0	1,052	−1,340	
Eritrea	1922	2	10	47	553	.....	1701		1/50	68	5,682	12.6	124	93	
French Equat. Africa (Congo)	1922	46	.....	45	750	.....	1128		1/50	.....	5,261	1.9	5	−4	
French West Africa	1922	171	.....	317	3,371	98	5,138	4,446	1/50	96	28,970	2.3	16	−7	
Madagascar	1922	3‡	‡	‡	7,819	400	175	150	1/4	.....	40,069	11.4	175	136	
Mauritius[1]	1923	1‡	‡	‡	17	3	2	7	1/3	.....	126	0.3	157	−1,410	
Morocco	1923	162	63	483	1,683	49	7,121	2,359	1/4	106	24,680	4.1	112	216	
Mozamblique	1923	.....	.....	.....	303	24	10	34	1/5	.....	1,656	0.5	4	−20	
Nyasaland	1922	.....	.....	.....	120	30	60	176	1/5	.....	823	0.5	16	−84	
Rhodesia, etc. (South Africa)	1923	158	4	24	3,189	32	2,367	1,316	133	.....	21,107	8.4	29	16	
Somaliland (*Total*)	1920	11	.....	.....	1,246	.....	1,666	.....	1/5	210*	12,250	19.1	90	79	
Tunis	1923	72	31	123	400	13	1,451	777	1/2	114	7,863	3.6	159	13	
Union of South Africa	1922	988	129	809	9,201	941	31,696	8,337	8,299	.....	99,453	14.3	210	165	400
Asia (Totals)	....	16,409	175[4]	6,652[4]	240,247†	92,061	85,685	50,589*	420,417*	1,465*		1.7	392	−284	
Ceylon	1923	2	.....	.....	1,398†	50	60	158	1/2	.....	7,450	0.9	246	−687	
China, proper	1916	5,501	*	4,557	24,449	78,505	26,511	10,000*	217,000	500*	376,313	0.6	132	−552	
Chosen	1922	53	2	10	1,608	1,101	2	23	6,002	.....	11,019	3.5	282	−0	
Cyprus	1923	3	9	43	47	39	332	177	1/2	1	1,012	1.0(1.4)	66(25)	omitting Java (−33)	
Dutch East Indies	1921	702	.....	.....	6,934†	902	955	1,954	1/3	.....	48,300				
Formosa	1921	.....	.....	.....	422†	1,281	.....	102	1/3	.....	4,205	1.2	305	−554	
India (Total including Ceylon)	....	2,201	82	1,676	180,857†	75	34,103	31,797	1/3	568	1,008,039	3.1	55		
(British)	1922	1,684	76	1,368	145,000†	.....	22,082	24,333	1/3	410	800,116	3.2	732	−22	
(French)	1922	.....	.....	.....	84†	25	31	30	1/3	.....	513	1.9	254		
(Native States)	1922	515	6	308	34,375†	.....	11,930	7,306	1/3	118	199,168	2.8	293	−51	

Japan, proper	1922	1,576			1,459	512	11	151	28,227		30,673	0.5	206	−1,085	25
Java and Madura	1921	273			5,060	97	842	1,421	1/3		31,579	0.9	625	−1,660	
Palestine	1922	6	4	33	93†		271	496	1/3	16	1,535	2 0	170	−112	
Philippine Islands	1921	279			3,336†	4,477	223	892	1/3		27,916	2.6	242	−66	
Russia in Asia	1922	5,456			7,278	1,038	9,314	1,745	16,411	282	123,615	4.5	16	6	
Siam	1924	166			6,270†	864			1/4		34,956	3.8	180	−24	
Straits Settlements	1919	2			67†	267			1/4		783	0.9	490	-132	
Syria	1923	(———	—44—	———)	196		2,047	907	1/3	46	4,747	1.6	79	−85	
Turkey	1923	350	78	333	3,551		11,914	2,300*	1/2	52	39,099	2.7	141	−31	
AUSTRALASIA (TOTALS)		2,750‡	4	13	17,944	1,415	102,389	266	26,100	11					1,395
Australia[5]	1922	2,390	4	13	14,337	986	78,803	230	22,000[6]	11	184,467	32.8	62	59	815
New South Wales	1922	660			4,005	341	34,864		7,000[6]		60,102	28.7	195	178	
Northern Territory	1922	40			761		6				3,782	945.5	7	7	
Queensland	1922	713			6,955	161	17,641		1,100[6]		59,178	78.2	88	85	
South Australia	1922	264			426	76	6,305		2,600[6]		12,016	24.3	32	27	
Tasmania	1922	37			218	46	1,558		660[6]		3,235	15.1	123	94	
Victoria	1922	495			1,786	295	11,766		10,200[6]		27,380	17.9	313	264	
West Australia	1922	181			940	68	6,664		440[6]		13,071	39.4	13	12	
Fiji Islands	1922	8‡	‡	‡	59	2	1	17	1/5		428	2.8	61	−11	
Guam	1920	4				1		1			52	3.7	260	28	
New Guiana and Papua	1921				2	1		1	1/10		28	0.04	0.2	−10	
New Zealand	1924	331			3,546	42	23,585	17	3,991		46,511	36.9	450	40	580
Samoa (American)						4			13		7	0.9	7	−192	
EUROPE (TOTALS)		37,412	2,025	3,081	106,331†	81,773	158,215	25,512	432,058	53[7]					18,390
Austria	1923	232			2,163	1,473	597	382	5,907	4	17,928	2.8	554	−99	
Belgium	1923	243	8	60	1,603	1,176	126	33	8450		14,206	1.9	1,202	−890	380
Bulgaria	1920	398	26	156	2,295†	1,090	8,923	1,332	4,752		28,838	5.8	723	305	
Czecho-Slovakia	1920	591			4,377	12,201	986	1,221	(1)		50,523	3.7	933	101	1,000
Denmark	1924	548			2,666	2,862	302	29	21,127		26,990	8.4	1,575	986	900
England and Wales	1924	1,232			5,894	3,227	14,843		28,169		62,371	1.7	1,070	−1,160	1,350
Esthonia	1923	210			513	338	666		(1)		6,474	5.8	352	98	
Finland	1922	398			1,844	378	1,571	12	879	53[7]	16,480	4.8	110	35	440
France	1923	2,848	192	284	13,749	5,406	9,925	1,353	39,200[4]		130,763	3.3	612	00	3,050

* Data quite unreliable.
† Including Buffaloes.
‡ Horses, mules and asses together.
[1] Animals on sugar estates only.
[2] Animals owned by Europeans.
[3] Besides this figure, 2,829,000 is given for sheep and goats together.
[4] Besides this figure, 44,000 is given for mules and asses together.
[5] Figures for the states of Australia are from the official Yearbook.
[6] Estimated.
[7] Reindeer.
[8] Alaska, 93,000 reindeer; 18,000 work dogs.
[9] Llamas and alpacas.

TABLE 13.—WORLD. TOTAL NUMBER OF ANIMALS, 1923—*Continued*

	Year	Horses, Thousands A	Mules, Thousands B	Asses, Thousands C	Cattle, Thousands D	Swine, Thousands E	Sheep, Thousands F	Goats, Thousands G	Poultry, Thousands H	Camels, Thousands I	Animal Units: Total J	Animal Units: Per Capita K	Animal Units: Per Square Mile L	Animal Units: Surplus or Deficiency per Square Mile M	Milk, Approximate Millions of Gallons N
EUROPE—(*Continued*)															
Germany	1923	3,651	26	5	16,691	17,308	6,105	4,675	65,205	.....	170,477	2.8	932	−113	3,800
Greece	1921	177	127	244	689†	404	5,739	3,717	5,073	.....	16,960	2.8	354	−61	
Hungary	1922	717	.....	.....	1,828	2,473	1,352	1	(1)	.....	23,960	3.0	668	−67	
Iceland	1922	51	.....	.....	26	.....	571	3	1/2	.....	1,351	14.2	33	26	
Irish Free State	1924	312	24	220	4,215	1,156	2,994	195	26,000*	.....	33,150	10.4	1,225	830	630
Italy	1918	1,015	500	969	6,624	2,509	12,029	3,146	65,000*	.....	79,743	2.0	657	−420	1,000
Latvia	1923	341	.....	.....	911	487	1,488	20	(1)	.....	11,232	6.1	453	204	
Lithuania	1923	506	.....	.....	1,285	1,697	1,413	.....	(1)	.....	17,188	3.6	288	24	
Luxemberg	1922	17	.....	.....	83	89	4	10	428	.....	814	3.1	821	−73	
Netherlands	1921	364	.....	.....	2,063	1,519	668	272	9,661	.....	18,914	2.7	1,438	−318	930
Northern Ireland	1924	96	.....	9	736	140	509	55	(1)	.....	5,775	4.3	1,030	239	200
Norway	1923	201	.....	.....	1,335	242	1,526	243	1,736	.....	11,373	4.3	91	21	325
Poland	1921	3,201	.....	.....	7,895	5,171	2,178	.....	25,191	.....	91,943	3.4	615	18	
Portugal	1920	90	.....	.....	741	921	3,851	1,493	(1)	.....	11,414	1.9	322	−238	
Rumania	1923	1,828	3	11	5,739†	2,925	12,481	585	(1)	.....	70,403	4.3	620	143	
Russia	1922	14,351	.....	.....	27,747	6,722	32,476	758	70,712	.....	368,132	3.1	212	−11	2,500
Scotland	1924	193	.....	.....	1,163	198	6,840	.....	4,608	.....	15,826	3.2	520	−16	250
Spain	1923	1,626	1,100	1,033	3,435	4,728	18,550	2,804	25,103	4	88,434	4.2	454	98	
Sweden	1920	728	.....	.....	2,736	1,011	1,568	113	4,871	.....	26,409	4.4	153	39	1,025
Switzerland	1921	134	4	1	1,425	640	245	330	3,296	.....	10,572	2.7	665	−146	610
Yugoslavia	1924	1,063	15	89	3,870	2,497	7,639	1,730	15,175	.....	46,803	3.9	486	75	
NORTH AMERICA (TOTALS)	....	25,294	6,244	112	88,728	74,709	43,299	5,979	545,550	111[3]	.....	.....	.....	.....	9,980
Alaska	1920	1	.....	.....	1	1	.....	.....	5	93[2]	138	2.5	0.2	−1	
Bahama Islands	1918	1	.....	.....	2	12	14	6	1/2	.....	61	1.2	14	−25	
Canada	1923	3,531	9	.....	9,246	4,405	2,754	.....	45,468	.....	104,434	11.6	26	22	1,280

Costa Rica	1923	105	8	.....	426	92	1	1	656	.....	3,783	7.8	203	117	
Cuba	1923	844	77	4	5,085	.....	.....	.....	1/2	.....	39,474	13.6	893	670	
Dominican Republic	1921	163	65	.....	647	674	.....	706	1/4	.....	7,462	8.3	388	235	
Guatemala	1922	86	.....	.....	319	96	185	17	1/4	.....	3,058	1.5	70	−83	
Hawaii	1920	24	11	2	142	39	44	5	79	.....	1,320	4.4	206	51	
Honduras	1918	.....	.....	.....	466	.....	.....	.....	1/4						
Jamaica	1922	50	.....	17	141	32	7	30	1/3	.....	1,719	2.0	382	−251	
Mexico	1923	356	249	.....	1,750	552	1,382	1,571	1/4	.....	20,918	1.4	27	36	
Newfoundland	1921	16	.....	.....	28	14	86	14	1/2	.....	461	1.7	11	−10	
Nicaragua	1921	.....	.....	.....	1,200	.....	.....	.....	1/4						
Panama	1916	15	2	.....	200	30	.....	5	1/4	.....	1,282	3.0	40	−4	
Porto Rico	1920	57	7	1	279	137	4	58	678	.....	2,540	1.9	748	−553	
Salvador	1906	74	.....	.....	284	423	21	.....	1/4	.....	3,039	2.0	230	−150	
United States	1924	19,969	5,814	87	68,500	68,200	38,800	3,564	491,600	.....	876,046	8.3	295	180	8,700
Virgin Islands	1917	2	2	1	12	2	1	2	1/4	.....	128	4.9	970		
			1865												1,230
South America (Totals)	....	17,304	1,126	893	100,687†	20,479	69,778	13,466	23,830	2,200[4]	.....	.....	.....	.....	1,160
Argentina	1922	9,432	623	289	37,065	1,437	36,209	4,820	1/2	.....	355,732	41.0	313	289	
Bolivia	1910	97	45	173	734	114	1,449	468	1/3	[4]	7,881	2.8	13	−7	
Brazil	1920	5,254	1865		34,271†	16,169	7,933	5,087	1/3	.....	291,375	9.5	93	62	
British Guiana	1923	2	2	5	102	12	15	8	1/4	.....	622	2.1	70	−4	
Chile	1922	329	44	34	1,996	263	4,569	525	1/2	.....	20,236	5.3	70	26	70
Colombia	1916	858	324	168	9,428	1,139	246	232	1/3	.....	66,078	10.6	153	102	
Dutch Guiana	1923	.....	.....	1	14	6	.....	4	1/4	.....	88	0.8	2	−5	
French Guiana	1916	.....	.....	.....	6	7	.....	.....	.....	.....	20	0.4	0.6	−6	
Paraguay	1923	490	19	20	4,000	87	600	93	1/4	.....	27,290	27.3	279	240	
Peru	1923	119	.....	.....	1,293	429	1,134	74	1/3	2,200[4]	13,311	1.8	25	−21	
Uruguay	1923	555	14	3	9,000	304	17,510	.....	1/3	.....	70,203	46.0	974	898	
Venezuela	1922	168	55	200	2,778	512	113	2,155	1/3	.....	19,292	8.0	49	38	
															31,420
World Totals	....	101,198	10,010	14,019	597,175†	272,290	527,863	130,124	1,473,418[1]	2,566	.....	.....	.....	.....	
		12†	1,909				2,829			146[2]					
										2,200[4]					
										18[3]					

* Data quite unreliable.
† Including Buffaloes.
[1] Estimated.

[2] Reindeer.
[3] Includes 18,000 work dogs.
[4] Llamas and alpacas.

TABLE 14—WORLD: ANIMALS PER SQUARE MILE AND ANIMALS PER THOUSAND PEOPLE, 1923

Continent and Country	Animals per Square Mile							Animals per Thousand People						
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	Horses	Mules	Asses	Cattle	Swine	Sheep	Goats	Horses	Mules	Asses	Cattle	Swine	Sheep	Goats
AFRICA:														
Algeria	0.9	0.8	1.2	4.6	0.5	40.5	16.5	34	30	46	176	19	1,548	647
Belgian Congo	.....	.....	.....	0.5	0.1	0.3	0.5	.....	.....	.....	33	3	20	33
British East Africa	.....	.....	0.1	1.1	.....	0.6	0.9	.....	.....	6	800	1	452	660
British South West Africa	.....	.....	0.1	1.7	.....	2.9	2.9	84	8	152	2,320	26	3,950	3,900
British West Africa	0.4	.....	0.9	6.3	0.2	5.9	9.5	8	.....	20	132	4	126	202
Cameroon (French)	0.9	.....	.....	1.7	.....	1.8	.....	1	.....	.....	19	.....	20	
Egypt	3.0	1.8	49.3	106.0	.....	78.7	32.8	3	2	45	96	.....	76	30
Eritrea	.....	0.2	1.0	12.1	.....	—3	7.0—	4	22	96	1,232	.....	—3,	780—
French Equatorial Africa	.....	.....	.....	0.8	.....	—1	.1—	16	.....	16	264	.....	—4	96—
French West Africa	0.1	.....	0.2	1.9	0.1	2.9	2.5	14	.....	26	284	8	418	362
Madagascar	.....	.....	.....	34.3	1.8	0.8	0.7	.....	.....	.....	2,220	114	50	43
Mauritius	1.3*	.....	.....	21.3	3.8	2.5	8.8	3*	.....	.....	45	8	5	19
Morocco	0.7	0.3	2.2	7.6	0.2	32.2	10.7	27	11	81	182	8	1,185	394
Mozambique	.....	.....	.....	0.7	0.1	.....	0.1	.....	.....	.....	97	8	3	11
Nyasaland	.....	.....	.....	3.0	0.8	1.5	4.4	.....	.....	.....	100	25	50	147
Rhodesia, etc.	0.2	.....	.....	4.4	.....	3.2	1.8	63	2	10	1,265	13	935	520
Somaliland (Italian)	0.1	.....	.....	9.0	.....	12.0	.....	17	.....	.....	1,920	.....	2,320	
Tunis	1.5	0.6	2.5	8.3	0.3	30.0	16.1	34	15	59	191	6	694	371
Union of South Africa	2.1	0.3	1.7	19.5	1.9	17.6	17.5	143	19	117	1,290	136	4,570	1,200
ASIA:														
Ceylon	0.1	.....	.....	54.7	2.0	2.3	6.2	.....	.....	.....	320	11	13	35
China, proper	3.6	?	3.0	16.0	51.2	17.3	6.5(?)	13	?	10	56	180	61	23(?)
Chosen	0.6	.....	0.1	19.1	13.1	.....	0.3	3	.....	1	93	64	.....	1
Cyprus	0.8	2.5	11.9	13.1	10.8	92.0	49.2	10	29	138	149	125	1,068	567

* Horses, Mules and Asses.

TABLE 14—WORLD: ANIMALS PER SQUARE MILE AND ANIMALS PER THOUSAND PEOPLE, 1923—*Continued*

Continent and Country	Animals per Square Mile							Animals per Thousand People						
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	Horses	Mules	Asses	Cattle	Swine	Sheep	Goats	Horses	Mules	Asses	Cattle	Swine	Sheep	Goats
Asia—(Continued):														
Dutch East Indies (omitting Java)	0.6	.....	.....	2.8	1.2	0.2	0.8	25	.....	.....	154	66	11	44
Formosa	.....	.....	.....	30.5	92.8	.....	7.4	.....	.....	.....	115	350	.....	28
India (Total)	1.2	.....	0.9	98.7	.....	1.9	1.7	7	.....	5	560	.....	105	98
(British)	1.5	.....	1.3	133.0	.....	20.2	22.3	7	.....	6	585	.....	89	98
(Native States)	0.7	.....	0.4	48.5	.....	16.8	10.3	7	.....	4	480	.....	166	102
Indo-China (French)	0.4	.....	.....	13.4	10.9	.....	0.2	6	.....	.....	194	158	.....	2
Japan, proper	10.6	.....	.....	9.8	3.4	0.1	1.0	27	.....	.....	25	9	.....	3
Java and Madura	5.4	.....	.....	100.0	1.9	16.6	28.1	8	.....	.....	144	3	24	40
Palestine	0.7	0.4	3.7	10.3	.....	30.1	55.1	8	5	43	120	.....	352	646
Philippine Islands	2.4	.....	.....	29.0	38.9	1.9	7.8	26	.....	.....	305	407	20	82
Russia in Asia	0.8	.....	.....	1.1	0.2	1.4	0.3	176	.....	.....	235	33	305	56
Siam	0.9	.....	.....	32.2	4.4	.....	.....	18	.....	.....	670	93		
Straits Settlements	1.3	.....	.....	41.9	166.8	.....	.....	2	.....	.....	76	305		
Syria	(——	0.7	——)	3.3	.....	34.0	15.1	(——	15	——)	65	.....	685	302
Turkey	1.2	0.3	1.2	12.6	.....	42.2	8.1	24	5	23	244	.....	821	159
Australasia:														
Australia	0.8	.....	.....	4.3	0.3	26.5	0.1	42	1	2	2,540	187	14,900	41
New South Wales	2.1	.....	.....	12.9	1.1	112.8	.....	315	.....	.....	1,912	163	16,640	
Northern Territory	0.1	.....	.....	1.5	.....	.....	.....	10,000	.....	.....	190,000	.....	15,000	
Queensland	1.1	.....	.....	10.4	0.2	25.2	.....	940	.....	.....	9,200	213	23,300	
South Australia	0.7	.....	.....	1.1	0.2	1.7	.....	533	.....	.....	860	154	12,720	
Tasmania	1.4	.....	.....	8.3	1.7	59.5	.....	174	.....	.....	1,020	216	7,300	
Victoria	5.6	.....	.....	20.3	3.4	134.0	.....	323	.....	.....	1,168	192	11,780	
West Australia	0.2	.....	.....	1.0	0.1	6.8	.....	545	.....	.....	2,840	21	20,060	
Fiji Isles	(——	1.1	——)	8.3	0.3	0.1	2.4	(——	52	——)	380	13	6	110
New Zealand	3.2	.....	.....	34.2	4.1	236.0	0.2	262	.....	.....	2,810	332	18,600	

TABLE 14—WORLD: ANIMALS PER SQUARE MILE AND ANIMALS PER THOUSAND PEOPLE, 1923—*Continued*

Continent and Country	Animals per Square Mile							Animals per Thousand People						
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	Horses	Mules	Asses	Cattle	Swine	Sheep	Goats	Horses	Mules	Asses	Cattle	Swine	Sheep	Goats
EUROPE:														
Austria	9.2	.....	.....	70.3	47.7	19.4	12.4	42	.....	.....	337	229	93	59
Belgium	20.8	0.7	5.1	137.0	100.8	11.8	2.8	32	1	8	214	158	17	4
Bulgaria	9.8	0.6	3.8	56.4	26.8	218.5	32.6	82	5	32	471	224	1,835	274
Czechoslovakia	10.9	.....	.....	80.5	224.5	18.2	22.4	43	.....	.....	321	895	72	90
Denmark	32.2	.....	.....	156.0	167.2	17.7	1.7	166	.....	.....	810	870	91	9
England and Wales	21.5	.....	.....	100.2	55.2	256.0	.....	33	.....	.....	151	85	392	
Esthonia	11.4	.....	.....	27.9	.....	36.2	.....	189	.....	.....	462	305	600	
Finland	2.7	.....	.....	12.3	2.5	10.5	0.1	117	.....	.....	542	111	461	4
France	13.4	0.9	1.3	64.5	25.4	46.6	6.4	73	5	7	350	138	253	35
Germany	20.0	0.1	.....	91.3	94.6	33.4	25.6	61	.....	.....	279	290	102	78
Greece	3.6	2.6	5.0	14.0	8.2	7.5	.....	30	21	41	116	68	972	
Hungary	20.0	.....	.....	51.0	68.8	37.7	.....	90	.....	.....	230	311	170	
Iceland	1.3	.....	.....	0.7	.....	14.4	0.1	538	.....	.....	274	.....	6,020	32
Irish Free State	11.6	0.9	8.1	156.0	42.7	111.0	7.2	99	8	70	1,340	367	948	62
Italy	8.5	4.2	8.1	55.2	20.9	100.0	26.2	26	13	25	170	64	308	81
Latvia	13.5	.....	.....	35.8	19.2	58.6	0.8	184	.....	.....	482	563	803	11
Lithuania	8.5	.....	.....	12.8	28.5	24.7	.....	105	.....	.....	246	354	294	
Netherlands	27.6	.....	.....	156.2	115.0	50.7	20.6	52	.....	.....	296	218	96	39
Northern Ireland	17.1	.....	1.6	131.8	25.0	91.0	9.8	79	.....	7	605	115	419	45
Norway	1.6	.....	.....	10.7	1.9	12.2	1.9	76	.....	.....	507	92	580	92
Poland	21.4	.....	.....	52.7	34.6	14.6	.....	118	.....	.....	290	191	80	
Portugal	2.5	.....	.....	20.6	25.9	108.4	42.0	15	.....	.....	123	153	636	248
Rumania	16.1	.....	0.1	50.5	25.7	110.0	5.1	11	.....	1	354	180	768	36
Russia	8.0	.....	.....	15.3	3.7	17.9	0.4	140	.....	.....	271	66	318	7
Scotland	6.3	.....	.....	37.4	6.5	225.5	.....	40	.....	.....	238	41	1,400	
Spain	8.3	5.6	5.3	17.7	24.2	95.2	19.5	76	52	48	162	222	870	179
Sweden	4.2	.....	.....	15.8	5.8	9.0	0.7	122	.....	.....	457	169	262	19
Switzerland	8.4	0.3	0.1	89.6	40.2	15.4	20.6	33	1	.....	366	164	63	85
Yugoslavia	11.0	0.2	0.9	40.2	26.0	79.5	18.0	88	1	7	322	207	632	144

TABLE 14—WORLD: ANIMALS PER SQUARE MILE AND ANIMALS PER THOUSAND PEOPLE, 1923—*Continued*

Continent and Country	Animals per Square Mile							Animals per Thousand People						
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
	Horses	Mules	Asses	Cattle	Swine	Sheep	Goats	Horses	Mules	Asses	Cattle	Swine	Sheep	Goats
NORTH AMERICA:														
Alaska														
Bahama Islands	0.2	.....	.....	0.5	2.7	3.2	1.4	69	.....	.....	38	226	264	113
Canada	0.9	.....	.....	2.5	1.2	0.7	.....	394	1	.....	1,030	480	306	
Costa Rico	5.6	0.4	.....	22.8	4.9	.....	.....	217	17	.....	880	19	2	2
Cuba	19.0	1.7	0.1	115.2	.....	.....	.....	291	27	1	1,755			
Dominican Republic	0.8	3.4	.....	33.4	34.8	.....	36.5	182	72	.....	720	750	.....	786
Guatemala	2.0	.....	.....	7.3	2.2	4.2	0.4	43	.....	.....	160	48	92	8
Hawaii	3.8	1.7	0.3	22.2	6.1	6.8	0.8	80	37	7	475	131	147	17
Honduras	.....	.....	.....	10.1	.....	.....	.....	.....	.....	.....	71			
Jamaica	11.1	.....	3.8	31.4	7.1	1.6	6.7	58	.....	20	162	37	8	35
Mexico	0.4	0.3	.....	2.3	0.7	1.8	2.0	25	17	.....	121	38	96	109
Newfoundland	0.4	.....	.....	0.7	0.3	2.0	0.3	60	.....	.....	106	53	326	53
Nicaragua	.....	.....	.....	24.2	.....	.....	.....	.....	.....	.....	1,885			
Panama	0.5	0.1	.....	6.2	0.9	.....	0.2	35	5	.....	461	69	.....	12
Porto Rico	16.8	2.1	0.3	82.0	40.4	1.2	17.1	42	5	1	207	102	3	43
Salvador	5.6	.....	.....	21.6	32.1	1.6	.....	48	.....	.....	186	276	14	
United States	6.7	2.0	.....	23.0	22.9	13.1	1.2	180	53	1	620	617	351	32
SOUTH AMERICA:														
Argentina	8.3	0.5	0.3	32.6	1.3	31.9	4.2	1,087	72	33	4,260	165	4,170	555
Bolivia	0.2	0.1	0.3	1.2	0.2	2.4	0.8	34	16	60	254	39	500	162
Brazil	1.7	(—0.	6—)	10.8	5.1	2.5	1.6	172	(—6	1—)	1,120	526	256	166
British Guiana	.....	.....	0.1	1.1	0.1	0.2	0.1	7	7	17	342	40	50	27
Chile	1.1	0.1	0.1	6.9	0.9	15.8	1.8	86	12	9	523	68	1,200	137
Colombia	2.0	0.7	0.4	21.6	2.6	0.6	0.5	136	51	27	1,495	181	39	37
Dutch Guiana	.....	.....	.....	0.3	0.1	.....	0.1	.....	.....	9	124	53	.....	35
French Guiana	.....	.....	.....	0.2	0.2	.....	.....	.....	.....	.....	123	143		
Paraguay	5.0	0.2	0.2	41.0	0.9	6.1	0.9	490	19	20	4,000	87	600	93
Peru	0.2	.....	.....	2.4	0.8	2.1	0.1	16	.....	.....	177	59	155	10
Uruguay	7.7	0.2	.....	124.6	4.2	240.3	.....	360	9	2	5,890	199	11,400	
Venezuela	0.4	0.1	0.5	*7.0	1.3	0.3	5.4	70	23	83	1,150	212	47	89

TABLE 15—UNITED STATES AND CANADA.* ANNUAL YIELD OF CHIEF CROPS

[Four-year Average (1921–1922–1923–1924), Except as Noted]

	A Rice, Thousands of Bushels	B Potatoes, Thousands of Bushels	C Wheat, Thousands of Bushels	D Cotton, Thousands of Bales[4] (500 lbs.) Rye (1000 bu.)	E Corn, Thousands of Bushels	F Sugar, Thousands of Short Tons	G Oats, Thousands of Bushels	H Barley, Thousands of Bushels	I Tobacco,[3] Thousands of Pounds	J Flax Seed, Thousands of Bushels	K Hay, Thousands of Short Tons
United States (Totals)	36,673	421,486	838,139	10,252	2,866,168	1,186	1,285,482	180,645	1,334,857	16,409	91,366
Alabama	.....	318	165	745	48,950	.....	4,995	.....	.....	.....	678
Arizona	.....	368	1,011	68	1,026	.....	630	1,068	.....	.....	550
Arkansas	6,491	2,202	855	887	42,314	.....	6,113	.....	.....	.....	709
California	6,290	8,948	11,148	47	4,142	120	3,985	26,821	.....	.....	5,065
Colorado	.....	14,637	21,079	.....	21,894	268	6,271	6,210	.....	36[2]	2,474
Connecticut	.....	3,169	.....	.....	3,424	.....	305	.....	35,444	.....	420
Delaware	.....	779	1,648	.....	5,796	.....	180	.....	.....	.....	114
Florida	64	2,268	.....	18	11,096	.....	469	.....	4,397	.....	109
Georgia	66	1,643	1,390	773	55,503	.....	7,635	.....	16,123	.....	548
Idaho	.....	12,403	24,793	.....	2,372	50	7,085	3,158	.....	.....	2,552
Illinois	.....	8,671	50,130	.....	312,488	.....	132,633	6,137	.....	.....	4,701
Indiana	.....	6,074	29,701	.....	163,921	.....	49,060	809	18,132	.....	3,070
Iowa	.....	7,650	12,146	.....	409,515	.....	210,017	4,254	.....	76	5,027
Kansas	.....	4,545	122,275	.....	112,048	.....	35,299	16,301	.....	204	3,281
Kentucky	.....	4,780	6,461	.....	86,278	.....	3,978	155	453,342	.....	1,453
Louisiana	17,730	1,777	.....	368	26,931	230[1]	1,202	.....	438	.....	255
Maine	.....	34,214	137	.....	930	.....	4,501	103	.....	.....	1,394
Maryland	.....	4,019	9,462	.....	23,651	.....	1,798	139	20,941	.....	575
Massachusetts	.....	3,741	.....	.....	2,754	.....	1,206	.....	11,364	.....	570
Michigan	.....	34,773	16,439	.....	57,284	121	48,782	3,860	.....	.....	4,068
Minnesota	.....	40,260	27,528	.....	142,239	.....	147,782	24,015	.....	4,868	3,050
Mississippi	17	1,214	59	872	42,529	.....	2,430	.....	.....	.....	510
Missouri	.....	7,414	33,797	122	182,119	.....	34,601	133	5,700	9[2]	4,150
Montana	.....	4,400	46,380	.....	7,007	.....	19,504	2,404	.....	1,102	2,066
Nebraska	.....	9,115	52,054	.....	216,366	92	70,836	6,260	.....	37	3,490
Nevada	.....	738	488	.....	25	.....	99	159	.....	.....	644
New Hampshire	.....	2,158	.....	.....	1,189	.....	673	26	.....	.....	510

New Jersey	.....	11,199	1,482	.....	9,623	.....	1,934	.....	.....	.....	450
New Mexico	.....	200	1,956	.....	4,354	.....	1,303	206	.....	.....	342
New York	.....	39,435	8,276	.....	28,529	.....	30,871	4,855	2,273	.....	6,430
North Carolina	.....	4,811	5,371	853	50,969	.....	4,731	.....	313,440	.....	867
North Dakota	.....	13,970	103,349	.....	22,439	.....	68,971	24,917	.....	7,612	1,476
Ohio	.....	10,506	36,411	.....	139,760	35	48,088	2,049	38,023	.....	4,588
Oklahoma	.....	2,701	42,875	804	59,415	.....	32,045	3,098	.....	.....	1,526
Oregon	.....	4,244	21,630	.....	2,219	.....	8,570	2,476	.....	.....	1,916
Pennsylvania	.....	25,989	23,233	.....	65,704	.....	36,518	293	58,503	.....	4,009
Rhode Island	.....	341	.....	.....	531	.....	30	.....	.....	.....	59
South Carolina	177	3,060	1,505	692	29,196	.....	9,072	.....	56,740	.....	325
South Dakota	.....	6,909	31,911	.....	120,269	.....	7,272	20,439	.....	2,414	1,722
Tennessee	.....	2,690	4,268	313	77,453	.....	74,677	314	100,417	.....	1,667
Texas	5,838	2,160	18,250	3,633	110,550	.....	39,942	2,363	.....	.....	993
Utah	.....	2,856	5,740	.....	700	120	3,093	748	.....	.....	1,381
Vermont	.....	3,960	89	.....	3,971	.....	2,736	259	.....	.....	1,225
Virginia	.....	16,503	9,862	31	48,110	.....	3,661	262	148,937	.....	1,154
Washington	.....	8,050	44,716	.....	2,598	.....	9,750	2,811	.....	.....	2,106
West Virginia	.....	4,913	2,856	.....	19,196	.....	4,677	.....	7,188	.....	994
Wisconsin	.....	29,916	2,535	.....	84,281	13	90,321	12,913	43,451	79	4,949
Wyoming	.....	1,948	2,685	.....	2,570	.....	5,062	640	.....	8	1,334
				Rye							
Canada (Totals)	.....	111,208	321,286	21,707[4]	14,346	25	482,727	64,963	29,095	5,707	13,901
Alberta	.....	6,645	67,160	3,869	.....	.....	71,601	10,211	.....	329	512
British Columbia	.....	3,237	1,029	135	.....	.....	2,312	295	.....	.....	243
Manitoba	.....	5,159	45,549	4,321	.....	.....	60,511	22,021	.....	812	248
New Brunswick	.....	14,441	429	8	.....	.....	8,634	178	.....	.....	926
Nova Scotia	.....	7,660	353	6	.....	.....	4,371	231	.....	.....	983
Ontario	.....	19,904	19,480	2,202	12,921	25	105,927	13,594	13,281	114	4,739
Prince Edward Island	.....	5,523	571	.....	.....	.....	5,582	135	.....	.....	317
Quebec	.....	40,675	2,938	418	1,425	.....	59,867	4,177	15,814	114	5,576
Saskatchewan	.....	7,964	183,767	10,748	.....	.....	163,923	14,121	.....	4,338	357

* All data except Hay for Canada are for the three years, 1920, 1921 and 1922. Hay 1917–21.

[1] Cane sugar.

[2] Data for 1 year.

[3] Average for 1922–1923–1924.

[4] Canadian production of rye in thousands of bushels in this column.

TABLE 16—UNITED STATES AND CANADA.* ANNUAL YIELD OF CHIEF CROPS PER CAPITA, PER ACRE AND PER SQUARE MILE, AND FARM PRICE OF CROPS (1921–1924)

SECTION I—POTATOES, WHEAT, CORN, OATS

(Four-year Averages)

	Potatoes				Wheat				Corn				Oats			
	A Yield per Capita	B Yield per Acre, Bushels	C Yield per Square Mile	D Farm Price per Bushel	E Yield per 1,000 People	F Yield per Acre, Bushels	G Yield per Square Mile	H Farm Price per Bushel	I Yield per 1,000 People	J Yield per Acre, Bushels	K Yield per Square Mile	L Farm Price per Bushel	M Yield per 1,000 People	N Yield per Acre, Bushels	O Yield per Square Mile	P Farm Price per Bushel
United States	.....	109	.....	$0.78	.....	14.1	.....	$1.04	.....	27.6	.....	$0.70	.....	30.4	.....	$0.45
Alabama	.1	81	6	1.56	734	10.4	3	1.51	22,700	13.9	950	0.96	2,220	18.5	970	0.77
Arizona	1.1	81	3	1.30	3,020	25.0	9	1.30	3,065	29.8	9	1.15	1,180	32.8	6	0.74
Arkansas	1.3	64	42	1.44	437	11.2	163	1.12	24,200	18.4	805	0.88	3,490	22.5	116	0.57
California	2.6	144	58	1.01	3,260	18.3	72	1.21	1,210	35.3	27	1.03	1,162	29.5	26	0.66
Colorado	15.6	126	141	.56	22,400	13.6	203	0.92	23,200	16.4	211	0.63	6,680	28.3	61	0.46
Connecticut	2.3	135	657	1.24	.....	.....	.....	.....	221	45.3	703	1.03	229	29.0	63	0.64
Delaware	3.5	89	395	.91	7,390	15.4	836	1.13	25,980	31.6	2,925	0.77	807	26.8	915	0.57
Florida	2.3	99	41	1.80	.....	.....	.....	.....	11,450	13.8	202	0.88	485	13.3	9	0.78
Georgia	0.6	70	28	1.54	480	9.6	24	1.60	19,500	12.9	945	0.90	2,640	18.5	130	0.80
Idaho	28.8	179	149	.53	50,730	23.3	293	0.93	5,500	37.5	29	0.80	16,400	40.8	65	0.45
Illinois	1.5	81	154	.98	7,720	16.6	891	1.07	48,200	34.8	5,555	0.65	20,500	32.5	2,360	0.39
Indiana	2.1	83	168	.99	10,120	15.0	825	1.15	56,000	34.2	4,550	0.62	16,700	27.8	1,360	0.39
Iowa	3.2	92	133	.85	5,060	19.8	216	1.01	170,000	38.9	7,350	0.60	87,500	35.6	3,780	0.35
Kansas	2.6	77	55	1.04	69,100	12.8	1,495	1.03	62,700	21.4	1,370	0.61	20,000	22.8	432	0.40
Kentucky	2.0	81	119	1.22	2,680	11.0	160	1.21	35,650	26.8	2,140	0.78	1,650	20.4	99	0.57
Louisiana	1.0	66	39	1.58	.....	.....	.....	.....	16,300	15.9	593	0.92	668	21.8	27	0.73
Maine	44.6	262	1,146	.61	179	23.5	5	1.58	1,220	42.8	23	1.06	5,860	36.8	113	0.56
Maryland	2.8	82	41	.98	6,520	16.4	954	1.25	16,320	37.3	2,382	0.78	1,240	30.2	180	0.54
Massachusetts	1.0	135	466	1.20	.....	.....	.....	.....	716	44.0	343	1.04	314	33.5	150	0.64
Michigan	9.4	108	605	.52	4,450	17.2	286	1.13	15,550	33.6	998	0.75	13,210	31.6	850	0.42
Minnesota	16.8	100	498	.48	11,520	14.5	340	1.06	59,500	34.5	1,763	0.58	61,700	34.9	1,830	0.33
Mississippi	0.7	77	27	1.70	33	14.3	1	1.34	23,750	15.5	920	0.94	1,350	19.0	52	0.73

Missouri	2.2	80	108	.99	9,840	12.3	490	1.09	53,400	28.6	2,645	0.70	10,300	22.1	516	0.43
Montana	8.0	110	30	.68	84,500	14.5	317	0.95	12,780	22.1	48	0.71	35,600	29.6	1,335	0.39
Nebraska	7.0	83	119	.75	40,200	14.6	678	0.96	167,000	27.6	2,820	0.57	54,600	28.6	932	0.33
Nevada	9.5	163	7	.98	6,800	24.1	4	1.29	322	25.1	.....	1.18	1,266	36.1	1	0.76
New Hampshire	4.9	158	238	1.10	.....	.....	.....	.....	2,680	45.5	132	0.99	1,520	37.4	75	0.64
New Jersey	3.5	130	1,489	.98	468	19.4	197	1.23	3,050	40.8	1,285	0.84	612	28.0	258	0.55
New Mexico	0.6	58	2	1.47	5,420	12.4	16	1.15	12,120	18.0	36	0.99	3,610	21.8	11	0.59
New York	3.8	119	830	.80	798	19.2	177	1.20	2,845	36.7	598	0.92	2,980	30.6	649	0.54
North Carolina	1.9	93	99	1.19	2,065	9.9	1.10	1.42	9,680	20.0	1,043	0.98	1,920	19.8	97	0.74
North Dakota	21.6	90	199	.44	159,600	11.4	1,470	0.97	34,600	27.3	320	0.54	106,600	27.3	980	0.28
Ohio	1.8	84	258	1.09	6,300	15.4	895	1.17	24,200	36.8	3,430	0.71	8,350	31.4	1,182	0.44
Oklahoma	1.3	67	40	1.42	21,150	12.4	617	1.00	29,300	18.8	856	0.70	15,800	22.8	463	0.44
Oregon	5.4	94	44	.82	27,600	19.7	226	1.03	2,830	32.1	23	0.97	10,950	31.8	90	0.50
Pennsylvania	3.0	104	578	.98	2,680	17.9	498	1.14	7,530	42.0	1,465	0.84	4,190	31.9	815	0.52
Rhode Island	0.6	128	320	1.19	880	.....	.....	.....	852	41.5	497	1.21	5	30.3	28	0.64
South Carolina	1.8	94	101	1.46	892	10.5	31	1.72	17,500	14.6	598	0.97	5,380	23.4	186	0.82
South Dakota	10.9	77	90	.61	50,200	11.8	415	0.96	190,000	29.3	1,562	0.52	121,000	31.0	1,025	0.31
Tennessee	1.2	81	65	1.25	1,825	10.1	102	1.26	33,100	23.8	1,852	0.83	2,000	20.4	112	0.58
Texas	0.5	58	8	1.70	3,930	11.8	70	1.11	23,650	20.2	420	0.87	8,550	26.8	152	0.53
Utah	6.4	171	35	.67	12,800	20.9	70	0.97	1,560	25.0	9	1.00	6,900	38.3	38	0.53
Vermont	11.3	159	434	.96	252	19.0	10	1.40	11,300	45.8	435	0.99	7,760	35.0	300	0.62
Virginia	7.1	107	410	.86	4,260	12.2	245	1.24	20,800	25.8	1,195	0.92	1,860	21.5	91	0.63
Washington	5.9	143	121	.75	33,000	18.3	670	1.01	1,920	37.9	40	1.00	7,180	46.4	146	0.52
West Virginia	3.4	102	204	1.13	1,945	12.6	119	1.26	13,200	32.5	798	0.96	3,190	23.8	195	0.62
Wisconsin	11.4	105	542	.53	965	17.1	46	1.07	32,000	38.4	1,522	0.74	34,300	35.5	1,630	0.41
Wyoming	10.0	103	20	.87	13,800	15.6	28	0.88	13,200	21.8	26	0.74	26,000	31.5	52	0.46
CANADA[1]	.....	153	.....	2.11	.....	15.1	.....	1.09	.....	47.6	.....	0.94	.....	30.8	.....	0.42
Alberta	14.5	145	79	1.85	114,300	14.0	806	1.02	.....	.....	.....	.....	121,700	27.1	860	0.32
British Columbia	7.1	180	50	2.67	1,920	22.2	16	1.55	.....	.....	.....	.....	4,410	42.4	36	0.72
Manitoba	8.8	135	89	1.97	74,600	14.8	786	1.19	.....	.....	.....	.....	99,000	31.1	1,045	0.39
New Brunswick	37.4	193	518	1.95	1,105	16.2	16	1.78	.....	.....	.....	.....	22,250	28.4	309	0.61
Nova Scotia	14.6	176	364	2.32	675	18.4	17	1.72	.....	.....	.....	.....	8,350	30.8	207	0.80
Ontario	6.9	122	126	2.32	6,650	21.2	123	1.31	4,420	51.2	82	0.87	36,050	35.5	670	0.46
Prince Edward Island	62.5	152	2,535	1.31	6,440	16.7	261	1.42	.....	.....	.....	.....	62,900	30.2	2,560	0.54
Quebec	18.0	162	205	2.27	1,240	16.0	15	1.79	605	29.1	7	1.34	25,250	26.4	302	0.70
Saskatchewan	12.2	141	85	2.06	242,000	15.1	1,952	1.05	.....	.....	.....	.....	216,000	31.0	1,740	0.31

* All data for Canada are for the years 1920–1921–1922. In all computations unorganized parts of Canada with less then 1 person per square mile are omitted.

TABLE 16 (SECTION II)—COTTON, HAY, BARLEY, TOBACCO, RYE (CANADA)

(Four-Year Averages)

	Cotton (Rye[2])				Hay				Barley				Tobacco			
	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	Yield per 1,000 People Pounds	Yield per Acre, Pounds	Yield per Square Mile Pounds	Farm Price per Pound	Yield per Capita Tons	Yield per Acre, Short Tons	Yield per Square Mile Tons	Farm Price per Ton	Yield per 1,000 People Bushels	Yield per Acre, Bushels	Yield per Square Mile Bushels	Farm Price per Bushel	Yield per Capita Pounds	Yield per Acre, Pounds	Yield per Square Mile Pounds	Farm Price per Pound
United States	93.6	138	3.5	$0.24	.....	1.51	.....	$13.16	1,632	24.4	60	$0.55	.....	754	.....	$0.21
Alabama	331.0	128	14.2	0.24	0.3	0.85	13	17.38								
Arizona	203.0	254	0.6	0.29	1.6	3.44	5	15.58	3,180	33.8	9	0.87				
Arkansas	516.0	150	16.9	0.24	0.4	1.21	14	14.63	7,820							
California	13.7	248	0.3	0.25	1.5	2.42	33	15.43	.....	26.4	172	0.76				
Colorado	.....	.....	.....	.....	2.6	2.05	24	10.10	6,600	23.5	60	0.56				
Connecticut	.....	.....	.....	.....	0.3	1.31	87	25.25	.....	.....	.....	.....	25,750	1,301	7,310	0.40
Delaware	.....	.....	.....	.....	0.5	1.39	58	18.63								
Flarida	1.9	93	0.3	0.23	0.1	0.88	2	19.50	.....	.....	.....	.....	4,545	968	80	0.44
Georgia	267.0	106	13.2	0.24	0.2	0.74	9	17.68	.....	.....	.....	.....	5,570	632	274	0.27
Idaho	.....	.....	.....	.....	5.9	2.47	31	9.45	7,280	34.5	.....	0.63	38			
Illinois	.....	.....	.....	.....	0.7	1.36	84	13.58	948	29.0	110	0.59				
Indiana	.....	.....	.....	.....	1.0	1.30	85	13.08	276	21.0	22	0.62	6,200	888	504	0.16
Iowa	.....	.....	.....	.....	2.1	1.56	90	10.80	1,765	28.0	76	0.53				
Kansas	.....	.....	.....	.....	1.9	2.05	40	9.78	.....	19.0	199	0.47				
Kentucky	.....	.....	.....	.....	0.6	1.32	36	16.25	.....	25.8	4	0.83	187,000	846	11.230	0.17
Louisiana	204.5	133	8.1	0.23	0.1	1.20	6	15.03	.....	.....	.....	.....	244	441	10	0.54
Maine	.....	.....	.....	.....	1.8	1.12	47	14.90	135	27.8	3	0.99				
Maryland	.....	.....	.....	.....	0.4	1.42	58	18.40	96	32.5	14	0.79	14,460	761	2,100	0.23
Massachusetts	.....	.....	.....	.....	0.1	1.35	71	25.00	.....	.....	.....	.....	2,960	1,290	1,415	0.36
Michigan	.....	.....	.....	.....	1.1	1.32	71	12.43	1,048	24.6	67	0.67				
Minnesota	.....	.....	.....	.....	1.3	1.52	38	10.53	10,020	25,9	298	0.49				
Mississippi	486.0	142	18.8	0.24	0.4	1.12	11	15.50								
Missouri	35.8	257	1.8	0.23	1.2	1.23	60	11.33	39	24.3	2	0.74	1,670	981	83	0.22
Montana	.....	.....	.....	.....	3.8	1.82	14	9.15	4,370	24.0	16	0.57				

Nebraska					2.7	2.21	45	9.50	4,820	23.9	82	0.46			
Nevada					6.0	2.60	4	11.50	2,055	28.7	2	0.93			
New Hampshire					1.2	1.15	57	21.25	59	25.9	3	1.00			
New Jersey					0.1	1.45	60	20.50							
New Mexico		238[1]			1.0	2.08	3	15.90	572	19.5	2	0.74			
New York					0.6	1.31	138	15.70	468	26.0	104	0.76	219	1,165	47	0.25
North Carolina	328.8	249	17.9	0.24	0.3	1.15	18	19.75					121,000	580	6,420	0.27
North Dakota					2.3	1.51	21	7.40	38,500	21.1	365	0.42				
Ohio					0.8	1.39	113	12.95	356	25.6	50	0.66	6,600	845	940	0.17
Oklahoma	396.0	122	11.6	0.23	0.8	1.61	22	12.08	1,525	21.5	45	0.60				
Oregon					2.4	1.95	20	11.93	3,160	29.8	26	0.73				
Pennsylvania					0.5	1.36	89	17.20	34	24.0	7	0.72	6,700	1,348	1,302	0.16
Rhode Island					0.1	1.30	55	26.08								
South Carolina	410.0	153	14.2	0.24	0.2	0.76	11	19.38						610	1,165	0.18
South Dakota					2.7	1.69	22	7.73	32,100	22.6	266	0.44				
Tennessee	134.0	168	7.5	0.24	0.7	1.22	40	17.60	135	21.6	8	0.98	42,800	744	2,395	0.19
Texas	770.0	129	13.9	0.23	0.2	1.43	4	13.55	506	23.8	9	0.64				
Utah					3.1	2.69	17	8.83	1,670	36.7	9	0.65				
Vermont					3.5	1.33	134	18.03	735	28.8	28	0.94				
Virginia	13.4	237	0.8	0.24	0.5	1.16	29	17.88	113	26.1	7	0.84	64,600	673	3,700	0.21
Washington					1.6	2.07	32	13.55	2,070	32.6	42	0.68				
West Virginia					0.7	1.32	41	17.95					4,900	809	299	0.22
Wisconsin					1.9	1.57	90	14.25	4,910	28.8	234	0.62	16,470	1,114	776	14.1
Wyoming					6.9	1.86	14	8.85	3,290	29.3	7	0.66				
	Rye[2]															
Canada	2,550	14.9	2	$0.88		1.27		$21.04[3]	8,350	24.6	20	$0.59		1,012		$0.16
Alberta	6,570	13.5	47	.81	1.1	1.03	6	15.33	17,320	27.1	123	0.32				
British Columbia	258	22.8	2	1.36	0.5	1.98	4	28.64	563	33.9	5	1.05				
Manitoba	7,080	15.4	74	.92	0.4	1.60	4	13.00	36,100	31.1	380	0.39				
New Brunswick	20	16.8		1.27	2.4	1.20	33	22.29	459	21.9	6	1.15				
Nova Scotia	11	16.5		1.46	1.1	1.47	47	23.75	440	25.4	11	1.22				
Ontario	750	16.2	14	1.00	1.6	1.31	30	19.32	4,630	29.5	86	.71		1,123	84	0.22
Prince Edward Island					3.6	1.17	146	22.67	1,520	25.6	62	0.68				
Quebec	177	17.2	2	1.46	2.5	1.18	28	24.00	1,760	23.1	21	1.11	6,980	955	79	0.11
Saskatchewan	14,200	14.7	104	0.82	0.5	1.37	4	9.75	18,600	25.3	150	0.47				

[1] 1923–1924 only.

[2] Canadian figures for rye in bushels in these columns.

[3] Includes clover hay.

TABLE 17—UNITED STATES AND CANADA.† TOTAL NUMBER OF ANIMALS ON FARMS
(All Numbers in Thousands)

	Horses, 1924	Mules, 1924	Dairy Cattle, 1924	Beef Cattle, 1924	Swine, 1924	Sheep, 1924	Goats, 1920	Poultry, 1920	Yearly Production of Eggs Dozens, 1919	Animal Units (Unit = Sheep (*See Page 184*)			
										Total Thousands of Units	Per Person	Per Square Mile	Surplus or Deficiency (− sign) per Square Mile
	A	B	C	D	E	F	G	H	I	J	K	[3]L	M
Alabama	121	314	516	422	850	128	104	6,267	23,437	13,727	5.6	268	106
Arizona	130	12	47	1,027	48	1,155	161	517	2,525	8,563	21.1	75	52
Arkansas	218	328	516	402	847	80	124	7,396	28,168	15,164	8.2	289	163
California	317	62	664	1,330	709	2,621	116	10,811	64,124	19,804	4.9	127	36
Colorado	384	36	271	1,202	466	2,616	29	2,994	14,172	16,413	16.1	158	106
Connecticut	34	.....	144	39	35	8	.....	1,154	6,341	1,513	1.0	314	−660
Delaware	24	9	40	10	40	3	.....	1,000	3,908	866	3.7	442	45
Florida	36	43	100	698	570	61	46	1,622	6,531	6,285	5.5	115	39
Georgia	86	375	540	632	1,485	60	110	7,621	23,182	16,555	5.4	282	103
Idaho	252	7	194	510	340	2,391	2	1,712	8,605	9,861	20.0	118	87
Illinois	1,125	167	1,194	1,468	4,348	540	10	25,865	105,758	39,889	5.7	712	255
Indiana	655	101	772	763	3,143	714	8	17,148	83,101	24,420	8.0	680	382
Iowa	1,229	97	1,303	3,204	8,958	891	11	28,353	120,697	56,716	22.6	1,020	832
Kansas	920	272	752	2,486	2,146	314	7	17,298	76,137	37,681	20.7	460	376
Kentucky	334	272	536	433	859	715	35	11,020	42,225	16,876	6.8	420	210
Louisiana	150	180	220	504	565	108	91	4,011	13,136	10,114	5.4	223	83
Maine	88	.....	206	57	63	94	.....	1,418	9,977	2,744	2.7	92	− 15
Maryland	132	33	206	101	254	97	1	3,689	15,086	4,585	3.0	462	−452
Massachusetts	44	.....	178	34	55	14	1	1,517	9,604	1,854	0.4	231	−1,390
Michigan	542	6	997	599	932	1,194	2	11,183	55,987	18,546	4.5	324	76
Minnesota	843	10	1,775	1,200	3,116	462	3	13,663	60,250	32,050	12.5	396	272
Mississippi	180	308	536	530	850	128	113	6,699	23,783	15,074	8.5	325	196
Missouri	793	369	825	1,898	3,481	1,181	121	15,611	117,204	38,930	11.2	568	392

Montana	593	9	220	1,285	292	2,536	1	2,128	11,858	18,277	28.3	125	35
Nebraska	857	116	605	2,696	4,545	726	2	11,932	49,133	37,955	28.0	495	418
Nevada	44	2	25	332	25	1,108	1	164	895	3,665	47.5	33	31
New Hampshire	32	.....	121	32	28	18	4	783	5,005	1,304	2.9	144	−20
New Jersey	67	6	153	29	113	10	1	2,666	13,280	2,287	0.7	304	−1,092
New Mexico	167	21	47	1,009	60	2,360	227	740	3,063	10,369	27.4	85	70
New York	485	7	1,595	373	446	570	3	10,759	62,175	18,319	1.6	383	−370
North Carolina	158	260	383	253	1,000	82	24	7,828	24,841	12,038	4.4	246	58
North Dakota	765	8	581	790	586	297	1	4,608	20,820	18,168	26.5	259	214
Ohio	748	32	1,101	823	2,462	2,178	4	20,604	102,377	27,426	4.3	673	141
Oklahoma	633	330	565	1,044	841	83	46	11,615	45,440	24,205	10.8	350	220
Oregon	221	13	243	531	209	2,612	134	2,574	14,626	9,503	11.2	99	65
Pennsylvania	466	54	1,081	486	994	492	3	15,227	75,998	18,040	1.9	400	−262
Rhode Island	5	.....	27	7	8	3	.....	266	1,537	273	0.4	256	−1,645
South Carolina	62	215	240	165	484	20	32	4,240	12,812	7,717	4.4	254	61
South Dakota	745	14	487	1,396	2,727	682	1	6,968	30,352	24,409	36.7	318	278
Tennessee	291	326	505	521	1,071	319	73	11,835	48,707	17,566	7.2	422	219
Texas	980	854	1,063	5,212	1,542	3,246	1,753	19,024	70,264	73,112	14.4	278	197
Utah	119	3	101	385	97	2,246	30	980	5,709	6,473	13.1	79	540
Vermont	73	.....	377	83	50	48	.....	815	5,167	3,416	9.7	374	248
Virginia	276	96	435	420	576	362	7	8,287	36,551	11,421	4.7	284	80
Washington	223	22	298	250	201	526	7	3,614	21,357	7,100	4.8	106	30
West Virginia	157	15	224	343	261	514	7	4,180	21,708	6,375	4.0	266	42
Wisconsin	605	4	2,261	849	1,294	351	2	11,762	53,322	26,626	9.5	482	295
Wyoming	180	3	49	746	119	2,808	2	646	3,166	9,327	42.2	96	78
UNITED STATES (TOTALS)	17,589	5,411	25,319	39,609	54,234	39,134	3,459	372,825	1,654,045				
Alberta	863	.....	392	1,261	623	260	.....	5,422	.....	20,790	35.3	82	86
British Columbia	51	.....	60	202	42	50	.....	1,911	.....	2,252	4.3	6	2
Manitoba	375	.....	252	489	235	113	.....	3,612	.....	9,220	15.1	37	35
New Brunswick	70	.....	146	157	85	236	.....	1,251	.....	2,879	7.4	107	51
Nova Scotia	59	.....	145	175	48	329	.....	950	.....	2,834	5.4	132	51
Ontario	686	.....	1,236	1,600	1,553	987	.....	13,964	.....	27,468	9.4	68	49
Prince Edward Island	33	.....	52	92	37	106	.....	846	.....	1,380	15.6	628	504
Quebec	369	.....	1,007	851	729	991	.....	6,518	.....	16,640	7.0	24	11
Saskatchewan	1,144	9	456	1,147	563	192	.....	8,456	.....	24,356	32.1	97	86
CANADA (TOTALS)	3,650	9	3,746	5,974	3,915	3,264	.....	42,931	194,058*				

† All Canadian figures are for 1922.

TABLE 18—UNITED STATES AND CANADA. ANIMALS PER SQUARE MILE.

(U. S., 1924, Canada, 1922)

	A Horses	B Mules	C Dairy Cattle	D Beef Cattle	E Swine	F Sheep	G Goats	H Poultry	I Eggs
Alabama	2.3	6.1	10.1	8.2	16.6	2.5	2.0	122	455
Arizona	1.1	0.1	0.4	9.0	0.4	10.4	1.4	5	22
Arkansas	4.1	6.2	9.8	7.6	16.1	1.5	2.4	140	535
California	2.0	0.4	4.3	8.5	4.6	16.8	0.7	70	412
Colorado	3.7	0.3	2.6	11.6	4.5	25.2	0.3	29	137
Connecticut	7.1	.....	29.9	8.1	7.3	1.7	.....	240	1,312
Delaware	12.2	4.6	20.4	5.1	20.4	1.5	.....	587	1,935
Florida	0.7	0.8	1.8	12.7	10.4	1.1	0.8	30	120
Georgia	1.5	6.4	9.2	10.7	25.4	1.0	1.9	130	395
Idaho	3.0	0.1	2.3	6.1	4.1	29.7	.....	21	103
Illinois	20.0	3.0	21.3	26.2	77.5	9.6	0.2	462	1,885
Indiana	18.1	2.8	21.4	21.1	87.2	19.8	0.2	475	2,300
Iowa	22.0	1.7	23.3	57.5	161.0	15.0	0.2	510	2,170
Kansas	11.2	3.3	9.2	30.4	26.3	3.8	0.1	212	935
Kentucky	8.3	6.8	13.3	10.8	21.4	17.8	0.9	275	1,050
Louisiana	3.3	4.0	4.9	11.1	12.4	2.4	2.0	88	290
Maine	2.9	.....	6.9	1.9	2.1	3.1	.....	47	324
Maryland	13.3	3.3	20.7	10.2	25.6	9.8	0.1	372	1,520
Massachusetts	5.5	.....	22.2	4.2	6.9	1.7	0.1	189	1,200
Michigan	9.4	0.1	17.4	10.4	16.2	20.8	.....	195	975
Minnesota	10.4	0.1	22.0	14.8	38.6	5.7	.....	169	750
Mississippi	3.9	6.6	11.6	11.4	18.3	2.8	2.4	144	510
Missouri	11.5	5.4	12.0	27.6	50.6	17.2	1.8	373	1,705
Montana	4.0	0.1	2.5	8.8	2.0	17.3	.....	15	81
Nebraska	11.1	1.5	7.9	35.0	59.0	9.4	.....	155	640
Nevada	0.4	.....	0.2	3.0	0.2	10.1	.....	2	8
New Hampshire	3.5	.....	13.4	3.5	3.1	2.0	0.3	87	555
New Jersey	8.9	0.8	20.4	3.9	15.0	1.3	0.1	355	1,765
New Mexico	1.4	0.2	0.4	8.2	0.5	19.3	1.8	6	25
New York	10.2	0.2	33.4	7.8	9.3	11.9	0.1	226	1,308
North Carolina	3.2	5.3	7.9	5.2	20.5	1.7	0.5	161	510
North Dakota	10.9	0.1	8.3	11.2	8.3	4.2	.....	66	296
Ohio	18.4	0.8	27.0	20.2	60.5	53.4	0.1	507	2,515
Oklahoma	9.1	4.8	8.1	15.0	12.1	1.2	0.7	168	655
Oregon	2.3	0.1	2.5	5.5	2.2	27.4	1.4	27	153
Pennsylvania	10.4	1.2	24.1	10.8	22.2	11.0	0.1	340	1,690
Rhode Island	4.7	.....	25.3	6.6	7.5	2.8	.....	250	1,440
South Carolina	2.0	7.0	7.8	5.4	15.8	0.7	1.1	139	420
South Dakota	9.7	0.1	6.3	18.3	35.5	8.9	.....	91	395
Tennessee	7.0	7.8	12.1	12.5	25.7	7.7	1.8	284	1,170
Texas	3.7	3.2	4.0	19.9	5.9	12.3	6.7	72	265
Utah	1.4	.....	1.2	4.7	1.2	27.3	0.4	12	69
Vermont	8.0	.....	41.3	9.1	5.5	5.3	.....	89	567
Virginia	6.8	2.4	10.8	10.4	14.3	9.0	0.2	206	910
Washington	3.3	0.3	4.5	3.7	3.0	7.9	0.1	54	320
West Virginia	6.5	0.6	9.3	14.3	10.8	21.4	0.3	174	900
Wisconsin	10.9	0.7	41.0	15.3	23.4	6.3	.....	213	965
Wyoming	1.8	.....	0.5	7.7	1.2	28.8	.....	7	32
UNITED STATES									
Alberta	10.4	.....	4.7	1.5	7.5	3.1	.....	65	
British Columbia	0.8	.....	0.9	3.1	0.6	0.8	.....	29	
Manitoba	6.5	.....	4.3	8.5	4.1	2.0	.....	62	
New Brunswick	2.5	.....	5.2	5.6	3.0	8.5	.....	45	
Nova Scotia	2.8	.....	6.9	8.3	2.3	15.6	.....	45	
Ontario	4.3	.....	7.8	10.1	9.8	6.2	.....	88	
Prince Edward Island	15.1	.....	23.8	42.2	16.9	48.5	.....	388	
Quebec	1.9	.....	5.0	4.3	3.7	5.0	.....	33	
Saskatchewan	12.2	0.1	4.9	12.2	6.0	2.0	.....	90	
CANADA									

TABLE 19—AVERAGE NUMBER OF ANIMALS PER THOUSAND INHABITANTS*

(U. S., 1924, Canada, 1922)

	A Horses	B Mules	C Dairy Cattle	D Beef Cattle	E Swine	F Sheep	G Goats	H Poultry, 1920	I Eggs, 1919
Alabama	49	128	211	172	347	52	42	2,665	10,000
Arizona	329	30	119	2,600	122	2,920	41	1,550	7,560
Arkansas	119	179	282	219	462	44	68	4,220	16,050
California	81	16	170	340	181	670	30	2,145	18,750
Colorado	384	36	271	1,202	466	2,616	29	3,190	15,100
Connecticut	23	.....	96	26	23	5	.....	835	4,600
Delaware	103	39	172	43	172	13	.....	4,490	17,500
Florida	34	40	94	654	534	57	43	1,680	6,750
Georgia	28	124	178	209	490	20	36	2,640	8,000
Idaho	52	15	403	1,060	706	4,970	4	3,960	20,000
Illinois	163	24	173	214	630	79	1	4,150	16,300
Indiana	216	33	254	251	1,035	235	3	5,860	28,400
Iowa	492	39	523	1,290	3,600	358	4	11,800	50,400
Kansas	510	151	416	1,380	1,190	174	4	9,800	42,900
Kentucky	135	110	231	175	347	289	14	4,570	17,500
Louisiana	81	96	118	270	302	58	49	2,225	7,300
Maine	103	.....	264	73	81	121	.....	1,845	13,000
Maryland	87	22	135	66	167	64	.....	2,550	10,400
Massachusetts	11	.....	44	8	13	3	.....	393	2,500
Michigan	133	1	245	147	229	294	1	3,040	15,150
Minnesota	333	4	702	474	1,232	183	1	5,720	25,600
Mississippi	100	172	299	296	474	71	63	3,740	13,260
Missouri	230	106	239	549	1,020	341	35	7,520	34,400
Montana	943	16	350	2,045	464	4,035	1	3,880	21,600
Nebraska	637	86	450	2,000	3,370	540	1	9,200	37,900
Nevada	568	25	323	4,290	323	14,330	13	2,120	11,550
New Hampshire	71	.....	270	71	62	40	9	1,770	11,300
New Jersey	19	2	44	8	33	3	.....	845	4,200
New Mexico	445	56	125	2,680	160	6,280	600	2,055	8,500
New York	44	6	146	34	41	52	.....	1,035	5,980
North Carolina	58	95	140	93	369	30	9	3,060	9,700
North Dakota	1,111	12	855	1,149	862	437	1	7,120	32,200
Ohio	120	5	177	132	396	350	1	3,580	17,800
Oklahoma	298	150	257	475	382	38	21	5,720	22,400
Oregon	265	16	291	637	251	2,420	160	3,280	18,700
Pennsylvania	51	6	118	53	107	53	.....	1,750	8,700
Rhode Island	8	.....	43	11	13	5	.....	440	2,545
South Carolina	35	123	136	94	284	11	18	2,515	7,650
South Dakota	1,130	21	735	2,120	4,120	1,030	2	10,950	47,700
Tennessee	121	135	210	216	445	132	30	5,060	20,820
Texas	195	170	212	104	307	646	349	4,075	15,050
Utah	245	6	208	795	20	4,630	62	2,180	12,710
Vermont	207	.....	1,070	246	142	136	.....	2,310	14,650
Virginia	114	40	179	173	237	149	3	3,550	15,380
Washington	153	15	205	172	138	362	5	2,660	15,750
West Virginia	100	9	142	218	166	316	4	2,860	14,840
Wisconsin	218	1	816	306	466	127	1	4,470	20,250
Wyoming	830	14	226	440	550	12,930	9	3,320	16,300
UNITED STATES (AVERAGES)	143	49	229	358	491	353	31	3,370	14,980
Alberta	1,885	.....	857	2,765	1,362	570	.....	1,185	
British Columbia	112	.....	131	440	92	119	.....	4,200	
Manitoba	634	.....	426	827	397	191	.....	6,130	
New Brunswick	180	.....	376	404	219	607	.....	3,220	
Nova Scotia	113	.....	278	334	92	629	.....	1,915	
Ontario	238	.....	427	552	537	340	.....	4,820	
Prince Edward Island	372	.....	585	1,036	416	1,198	.....	9,520	
Quebec	162	.....	440	374	321	436	.....	2,800	
Saskatchewan	1,752	14	700	1,760	864	294	.....	13,000	
CANADA (AVERAGES)	407	1	418	666	436	364	.....	4,770	21,620

* In Canada relatively unorganized districts with less than 1 inhabitant per sq. mi. are omitted.

TABLE 20—UNITED STATES AND CANADA. AVERAGE PRICE OF ANIMALS

U. S., 1924; Canada, 1922.

	A Horses	B Mules	C Dairy Cattle	D Beef Cattle	E Swine	F Sheep	G Wool Weight per Fleece, Pounds	H Poultry[1] onFarms, Average Value, 1920	I Chicken Eggs, Average Value, per Doz. 1919
Alabam	$69	$89	$26	$9	$9	$4	3.7	$0.81	$0.37
Arizona	58	84	70	25	11	9	6.0	1.24	0.46
Arkansas	51	63	25	9	8	4	4.5	0.83	0.35
California	76	91	73	30	10	9	7.3	1.41	0.50
Colorado	40	54	45	23	11	10	7.0	0.98	0.39
Connecticut	125	.....	78	32	22	9	6.0	1.72	0.60
Delaware	73	88	60	30	14	10	5.5	1.22	0.51
Florida	97	138	54	14	7	3	3.2	1.09	0.47
Georgia	86	114	30	11	9	3	3.0	0.90	0.41
Idaho	43	53	50	23	11	11	8.0	0.87	0.40
Illinois	67	72	59	33	14	10	7.6	0.98	0.38
Indiana	67	70	57	32	12	11	7.0	0.98	0.39
Iowa	70	73	58	33	15	12	7.6	0.98	0.35
Kansas	44	57	49	26	12	9	7.4	0.89	0.34
Kentucky	50	60	37	19	9	9	4.5	0.84	0.36
Louisiana	60	89	37	13	8	3	3.7	0.93	0.38
Maine	118	.....	52	25	19	8	6.3	1.56	0.55
Maryland	74	92	60	34	13	10	5.9	1.14	0.44
Massachusetts	123	.....	75	27	17	10	6.4	1.94	0.64
Michigan	82	83	60	26	14	11	2.4	1.04	0.42
Minnesota	75	80	51	22	14	11	7.6	0.83	0.36
Mississippi	61	87	25	8	8	3	3.3	0.97	0.37
Missouri	46	60	44	28	9	9	6.7	0.99	0.36
Montana	30	50	50	27	12	10	8.7	0.94	0.40
Nebraska	55	69	54	29	13	10	7.8	0.86	0.34
Nevada	54	57	60	24	12	11	8.0	1.12	0.48
New Hampshire	103	.....	59	24	18	8	6.6	1.71	0.57
New Jersey	109	122	75	42	18	9	6.0	1.62	0.55
New Mexico	37	58	45	22	11	8	6.0	1.02	0.43
New York	106	110	62	26	17	11	6.9	1.43	0.50
North Carolina	98	118	40	16	12	6	5.2	0.94	0.41
North Dakota	53	63	44	21	13	10	7.9	0.80	0.34
Ohio	84	88	57	31	12	9	7.3	1.00	0.42
Oklahoma	38	58	34	17	9	7	7.4	0.93	0.35
Oregon	64	71	60	26	11	10	9.1	1.19	0.44
Pennsylvania	94	103	61	31	16	9	6.7	1.22	0.47
Rhode Island	122	.....	80	29	20	10	6.4	1.87	0.59
South Carolina	96	121	36	13	11	4	4.5	1.01	0.45
South Dakota	46	61	47	26	13	11	7.5	0.88	0.33
Tennessee	60	70	31	14	9	6	4.4	0.89	0.37
Texas	53	81	33	20	10	7	7.9	0.88	0.37
Utah	58	55	58	22	12	11	8.2	0.83	0.37
Vermont	102	.....	57	19	14	8	6.5	1.43	0.54
Virginia	70	90	40	27	11	9	4.9	1.08	0.42
Washington	60	66	65	27	13	11	9.0	1.21	0.48
West Virginia	75	84	40	29	12	8	5.2	1.01	0.41
Wisconsin	87	84	55	23	13	10	7.3	0.91	0.38
Wyoming	28	51	50	28	11	10	8.0	0.98	0.41
UNITED STATES (AVERAGE)	63	81	60	24	12	10	7.4	1.00	0.40
Alberta	60	.....	38	30	9	7			
British Columbia	105	.....	69	46	11	9			
Manitoba	110	.....	42	34	8	7			
New Brunswick	155	.....	40	36	11	6			
Nova Scotia	133	.....	45	40	11	6			
Ontario	121	.....	58	48	10	9	Data not available		
Prince Edward Island	119	.....	47	35	10	7			
Quebec	135	.....	45	35	12	8			
Saskatchewan	93	.....	40	33	8	7			
CANADA (AVERAGE)	111	.....	48	38	10	8			

[1] In 1920 the average value of all poultry in the United States was $1.00, and that of chickens $0.97.

TABLE 21—UNITED STATES. INDEX NUMBERS OF COMPOSITE CROP YIELDS *

State	A Highest Index Number 1910–1924	B Lowest Index Number 1910–1924	C Range from Highest to Lowest 1910–1924	D Average Index Number 1910–1924
Alabama	110	64	46	93
Arizona	116	75	41	101
Arkansas	110	66	44	96
California	110	88	22	100
Colorado	107	78	29	94
Connecticut	112	94	18	102
Delaware	112	88	24	101
Florida	112	91	21	101
Georgia	111	60	51	91
Idaho	108	79	29	94
Illinois	118	80	38	102
Indiana	113	88	25	100
Iowa	128	82	46	104
Kansas	129	61	68	101
Kentucky	109	83	26	100
Louisiana	107	73	34	95
Maine	122	84	38	103
Maryland	113	90	23	101
Massachusetts	116	90	26	102
Michigan	111	85	26	100
Minnesota	123	79	44	102
Mississippi	103	66	37	93
Missouri	124	71	53	100
Montana	107	40	67	86
Nebraska	137	74	63	101
Nevada	126	83	43	104
New Hampshire	119	85	34	105
New Jersey	121	88	33	103
New Mexico	110	59	51	93
New York	111	84	27	103
North Carolina	108	82	26	99
North Dakota	142	43	99	96
Ohio	112	89	23	101
Oklahoma	140	62	78	96
Oregon	117	77	40	98
Pennsylvania	110	91	19	102
Rhode Island	115	89	26	101
South Carolina	106	68	38	93
South Dakota	139	48	91	100
Tennessee	105	86	19	98
Texas	124	65	59	97
Utah	109	78	31	97
Vermont	119	87	32	104
Virginia	114	86	28	103
Washington	118	68	50	98
West Virginia	123	78	45	101
Wisconsin	114	86	28	103
Wyoming	113	65	48	93
United States	.....	.....	.....	99

* In computing the yield for each state only the land planted in crops is considered. The yield per acre of the various crops is weighted according to the relative importance of each crop. The resultant figure shows the productivity of an average acre of cropped land in one state or year compared with another state or year. Irrigated areas such as most of the cropped land in Nevada naturally have a high composite index number of crop yields, while places like North Dakota where highly extensive agriculture is practiced have a low index number. Allowance is made for general trends whereby the yield of various crops tends to increase or decline by reason of better culture, exhaustion of the soil, etc.

TABLE 22—WORLD: QUANTITY AND VALUE OF FISHERY PRODUCTS
(See Note on Table A, Page 507)

Continent and Country	Fishery Products			
	Year	Quantity, Millions of Pounds	Value, Millions of Dollars	Price per Pound, Cents
AFRICA (EXCEPT EGYPT)	est.	.....	5.0	
Egypt	1922	80.4	8.1	10.0
ASIA:				
China	est.	.....	150.0[2]	
India and South Western Asia	est.	.....	20.0	
Japan	1918	2,500.0[2]	89.4	3.6
AUSTRALIA AND NEW ZEALAND	est.	.....	5.6	
EUROPE:				
Austria-Hungary	1911	.....	2.1	
Belgium	1912	.....	1.1	
Denmark[1]	1921	185.8	9.9	5.3
England and Wales	1923	1,289.6	65.3	5.1
France	1919	.....	84.7	
Germany	1919	754.4	10.8[2]	1.4
Greece	1923	85.0[3]	28.0[3]	3.3
Ireland	1923	.....	8.7	
Italy	1916	.....	3.4	
Ireland	1921	53.4	1.6	3.0
Netherlands	1921	373.7	10.8	2.9
Norway	1922	.....	14.0[4]	
Portugal	1918	.....	36.9	
Russia	est.	1,206.0[2]	50.0[2]	4.1
Scotland	1922	666.6	18.8	2.8
Spain	1920	889.8	72.2	8.1
Sweden	1918	300.4	22.7	7.6
Other Europe	est.	.....	4.8	
NORTH AMERICA:				
Canada	1922	.....	27.6	
Latin America	est.	.....	13.0	
Newfoundland	1920	.....	35.0[2]	
United States and Alaska	1918–22	2,756.6	90.4	3.2
New England States	1919	467.3	19.8	4.3
Middle Atlantic States	1920–21	863.7	24.4	2.8
South Atlantic States	1918	332.6	5.3	1.6
Gulf States	1918	130.9	6.5	5.0
Pacific Coast States	1915	286.2	9.3	3.3
Mississippi River division	1922	105.7	4.5	4.3
Great Lakes	1917	103.8	6.3	6.1
Lake of the Woods and Rainy Lake	1917	2.2	.1	5.5
Alaska	1923	315.4	10.7	3.4
SOUTH AMERICA:				
Argentina	est.	48.8	2.0[2]	4.1

[1] Including Faroe Islands.
[2] Estimated.
[3] Exclusive of sponges.
[4] Exclusive of seal and whale products.

TABLES PERTAINING TO INDUSTRIES OTHER THAN AGRICULTURE

TABLE 23—WORLD: FOREST RESOURCES AND PRODUCTION

(See Note on Table A, Page 507)

(Many of the figures given in this table for the countries of Africa and Asia are extremely rough estimates. Blank spaces in columns F–K represent unavailable or unsatisfactory data.) Data are from Zon and Sparkawk: Forest Resources.

Continents and Countries	A Ratio of Forest to Total Land Area Per cent	B Forest Area per 10 Inhabitants, Acres	C Percentage of Area in Conifers	D Percentage of Area in Temperate Hardwoods	E Percentage of Area in Tropical Hardwoods	F Per Cent of Forests Publicly Owned	G Per Cent of Forests Privately Owned	H Annual Growth,† Millions of Cubic Feet	I Annual Cut of Saw Timber, Millions of Cubic Feet	J Annual Cut of Firewood, Millions of Cubic Feet
WORLD	22.5	44	35.4	16.0	48.6	66.6*	33.4*	38,035.1	26,115.9	30,106.2
AFRICA	10.7	56	0.9	2.2	96.9	.....	.....	989.0	62.5	654.9
Abyssinia	6.6	19	3.0	17.0	80.0	.....	.....	.....	1.6	30.4
Algeria	5.0	13	50.0	50.0	.....	74.6	25.4	15.0	1.5	13.5
Angola	3.2	24	.....	.....	100.0	.....	.....	20.6	1.0	19.6
Belgian Congo	30.9	150	.....	.....	100.0	.....	.....	.....	3.1	59.4
British East Africa	3.0	14	1.5	7.5	91.0	99.0	1.0	58.7	2.7	55.6
British South Western Africa	0.5	50	.....	.....	100.0	.....	.....	0.8	.....	0.8
British West Africa	56.1	76	.....	.....	100.0	100.0	.....	527.5	4.9	114.0
Cameroon (French)	25.4	145	.....	.....	100.0	.....	.....	9.3	0.8	8.5
Egypt and Sudan	0.8	4	.....	.....	100.0	.....	.....	7.9	.....	7.9
French Equatorial Africa	41.7	100	.....	.....	100.0	.....	.....	44.5	6.5	38.0
French Western Africa	0.3	30	.....	.....	100.0	.....	.....	27.3	3.0	24.4
Guinea (Portuguese)	10.1	31	.....	.....	100.0	.....	.....	1.4	.....	1.4
Liberia	62.5	80	.....	.....	100.0	.....	.....	10.0	0.5	9.5
Libia	1.0	25	15.0	85.0	.....	.....	.....	.....	0.2	3.8
Madagascar	16.1	66	.....	.....	100.0	.....	.....	.....	2.1	33.7
Morocco	2.6	7	43.0	57.0	.....	.....	.....	27.0	1.4	25.6
Mozambique	6.9	60	1.0	9.0	90.0	.....	.....	15.6	0.8	14.8
Nyasaland	1.0	3	0.8	.....	99.2	100.0	.....	.....	0.9	16.2
Rhodesia, etc.	36.5	679	.....	0.3	99.7	60.0	40.0	108.6	10.2	117.2
Somaliland (British)	1.1	17	.....	.....	100.0	.....	.....	.....	0.1	1.1
Tunis	9.4	15	15.0	85.0	.....	94.2	5.8	8.6	1.2	7.4
Union of South Africa	0.5	3	20.0	80.0	.....	39.0	61.0	104.3	19.8	46.1
ASIA	21.6	24	42.4	27.3	30.3	90.0*	10.0*	7,874.3	1,556.3	6,372.8
Afghanistan	1.5	4	30.0	70.0	.....	.....	.....	.....	3.2	28.7
Arabia	1.5	2	.....	.....	100.0	.....	.....	.....	2.5	22.5

Borneo (British)	95.8	736	.....	.....	100.0	100.0	.....	.....	1.8	3.3
Borneo (Dutch)	80.0	690	.....	.....	100.0	90.0	10.0	[2]	[2]	[2]
Celebes	26.7	41	.....	.....	100.0	90.0	10.0	[2]	[2]	[8]
Ceylon	79.9	28	.....	.....	100.0	99.2	0.8	25.9	0.8	14.8
China, proper	12.2	4	45.0	50....	5.0	90.0*	10.0*	1,972.3	284.2	1,688.1
Chosen	53.5	18	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]
Dutch East Indies	41.4	33	.....	.....	100.0	90.0	10.0	187.9	10.8	177.1
Formosa	79.2	20	[3]	[3]	[3]	[3]	[3]	[3]	[3]	[3]
India (Total)[7]	23.3	9	0.9	0.9	98.2	82.0	18.0	1,202.9	174.8	1,413.1
(British)	31.1	9	1.0	1.0	98.0	77.1	22.9			
(Native States)	9.9	6	1.0	1.0	98.0	100.0				
Indo-China (French)	33.4	36	1.6	.....	98.4	100.0	.....	79.9	23.9	56.0
Japan, proper[3]	47.9	8	24.8	68.5	6.7	62.3	37.7	2,540.0	383.4	1,872.2[3]
Java and Madura	22.1	2	.....	.....	100.0	90.0	10.0	[2]	[2]	[2]
Malay States	66.5	91	.....	.....	100.0	97.1	12.9	188.3	25.0	237.5
Manchuria	27.8	76	[6]	[6]	[6]	[6]	[6]	[6]	[6]	[6]
Palestine and Syria	1.7	2	45.5	38.9	15.6	88.0	12.0	.....	0.9	17.4
Persia	8.0	32	.....	100.0	.....	100.0	.....	.....	14.7	135.9
Philippine Islands	50.0	43	3.3	.....	96.7	97.5	2.5	554.6	17.7	17.6
Russia in Asia	29.3	397	68.0	32.0	.....	95.2	4.8	1,100.0	571.0	529.0
Russian Turkestan	14.7	59	25.0	75.0	.....	95.0	5.0			
Sarawak	80.0	358	.....	.....	100.0	100.0	.....	[1]	[1]	[1]
Siam	22.5	40	.....	.....	100.0	100.0	.....	48.5	11.1	37.4
Siberia	30.5	753	70.0	30.0	.....	95.8	4.2			
Straits Settlements	17.6	2	.....	.....	100.0	100.0	.....	[4]	[4]	[4]
Sumatra	25.0	57	.....	.....	100.0	90.0	10.0	[2]	[2]	[2]
Turkey	13.4	17	22.0	78.0	.....	93.9	6.1	.....	30.6	122.2
AUSTRALASIA	15.1	347	5.4	5.4	89.2	90.4	9.6	472.4	92.7	181.9
Australia	5.8	176	4.0	11.0	85.0	79.3	20.7	428.0	49.9	147.5
New South Wales	5.6	55	13.6	.....	86.4	72.7	27.3	110.0	11.9	50.0
Queensland	9.3	571	2.5	.....	97.5	85.0	15.0	7.3	11.7	9.0
South Australia	1.6	85	.....	.....	100.0	100.0	.....	38.0	0.2	11.1
Tasmania	64.7	527	10.0	90.0	.....	15.2	84.8	110.0	4.3	5.2
Victoria	14.2	56	.....	.....	100.0	97.5	2.5	149.4	8.3	40.1
West Australia	2.6	497	.....	.....	100.0	98.8	1.2	13.3	13.4	32.0

* Estimated. No exact data available.

† This figure does not include vast areas of virgin tropical forest as well as much of the virgin forest of the temperate regions, because there are no data available and no attempts are made even to prevent or check devastation by fire. It will be noted that 22,586,500,000 cu. ft., or more than half of the world total, is given for the growth in Europe, where the forests are managed for the production of timber.

[1] Figure for British Borneo includes Sarawak.
[2] See Dutch East Indies.
[3] In columns where no figures appear for Chosen and Formosa, those regions are included with Japan.
[4] Included with Malay States.
[5] Included with figure for China, proper.
[6] Including Ceylon.

TABLE 23—WORLD: FOREST RESOURCES AND PRODUCTION—*Continued*

Continents and Countries	A Ratio of Forest to Total Land Area	B Forest Area per 10 Inhabitants, Acres	C Percentage of Area in Conifers	D Percentage of Area in Temperate Hardwoods	E Percentage of Area in Tropical Hardwoods	F Per Cent of Forests Publicly Owned	G Per Cent of Forests Privately Owned	H Annual Growth,† Millions of Cubic Feet	I Annual Cut of Saw Timber, Millions of Cubic Feet	J Annual Cut of Firewood, Millions of Cubic Feet
AUSTRALASIA—*Continued.*										
Fiji Islands	25.0	98	.....	.....	100.0	.....	.....	0.6	.....	0.6
Guama	5.0	7	.....	.....	100.0	.....	.....	0.05	.....	0.04
New Guinea and Papua	80.0	1,778	.....	.....	100.0	100.0	.....	3.6	0.2	3.4
New Zealand	25.7	161	68.0	32.0	.....	61.4	38.6	34.0	42.0	25.0
Samoa	70.0	124	.....	.....	100.0	.....	.....	0.2	.....	0.2
EUROPE	31.1	17	74.0	26.0	.....	54.0	46.0	22,586.5	9,160.2	7,842.9
Austria	37.7	12	60.0	40.0	.....	35.6	64.4	265.0	132.5	132.5
Belgium	18.2	2	28.9	71.1	.....	38.0	62.0	75.8	28.7	54.5
Bulgaria	28.0	14	33.3	66.7	.....	82.9	17.1	112.0	18.6	49.6
Czechoslovakia	34.3	9	54.1	45.9	.....	36.1	63.9	564.8	353.0	211.8
Denmark	8.2	3	49.9	50.1	.....	52.9	47.1	40.0	13.5	22.0
England and Wales	5.1	0.5	.....	100.0	.....	3.5	96.5	15.7*	6.6*	8.6*
Esthonia	13.3	11	65.0	35.0	.....	8.6	91.4	68.8	67.4	55.1
Finland	60.0	147	87.5	12.5	.....	35.1	64.9	1,242.0	877.8	438.9
France	18.7	6	20.6	79.4	.....	36.5	63.5	963.0	300.0	663.0
Germany	23.8	5	67.0	33.0	.....	52.7	47.3	1,545.0	604.6	567.8
Greece	15.0	9	65.0	35.0	.....	90.0	10.0	90.0	36.4	85.0
Hungary	14.0	4	5.0	95.0	.....	30.0	70.0	126.0	14.2	80.3
Ireland	1.5	0.6	32.0	65.0	.....	6.5	93.5	14.7*	6.2	6.9
Italy	18.1	4	4.1	95.9	.....	49.7	50.3	413.2	72.7	388.4
Latvia	19.4	12	65.0	35.0	.....	30.1	69.9	106.4	68.8	56.2
Lithuania	19.1	10	70.0	30.0	.....	37.2	62.8	156.3	102.3	83.7
Luxemburg	30.9	7	12.5	87.5	.....	40.0	60.0	6.0	2.1	3.9
Netherlands	8.0	1	51.1	48.9	.....	30.6	69.4	32.0	16.0	16.0
Norway	21.4	65	75.0	25.0	.....	21.0	79.0	320.5	282.7	149.3
Poland	22.8	9	47.0	53.0	.....	30.4	69.6	177.5	302.5	365.0
Portugal	22.0	8	48.0	52.0	.....	1.7	98.3	100.0	26.0	74.0
Rumania	27.8	12	28.7	71.3	.....	50.8	49.2	370.7	150.9	250.9
Russia	38.7	44	88.0	12.0	.....	66.8	33.2	12,711.0	4,000.0	3,000.0
Scotland	6.0	2	100.0	.....	.....	0.1	99.9	17.1*	7.2*	9.5*
Spain	13.9	8	19.2	80.0	.....	70.4	29.6	120.0	33.0	127.0

Sweden	54.8	96	87.5	12.5	.....	23.6	76.4	1,312.1	1,191.4	373.4
Switzerland	22.7	6	70.0	30.0	.....	72.5	27.5	81.0	35.6	45.4
Yugoslavia	25.2	12	25.0	75.0	.....	66.6	33.4	690.0	284.5	499.2
NORTH AMERICA	26.8	100	72.4	20.1	7.5	.....	.....	4,459.0	14,985.6	12,820.8
Alaska	25.0	17,270	94.7	5.3	.....	100.0	.....	.....	12.0	11.0
Bahama Islands	13.0	65	75.7	.....	24.3	86.5	14.5	1.5	1.0	0.6
British Honduras	75.0	900	44.6	.....	55.4	40.0	60.0	1.3	0.9	0.4
Canada	25.0	823	91.6	8.4	.....	93.3	6.7	.....	1,106.9	1,393.1
Costa Rica	75.2	194	15.0	.....	85.0	60.0*	40.0*	9.0	4.0	5.0
Cuba	46.0	45	5.0	.....	95.0	15.0	85.0	39.0	18.0	38.0
Dominican Republic	77.0	100	14.2	.....	85.8	90.0*	10.0*	11.0	1.0	10.0
Guatemala	65.0	90	10.0	.....	90.0	90.0*	10.0*	20.0	1.0	20.0
Haiti	60.0	17	4.7	.....	95.3	60.0*	40.0*	24.5	4.5	20.0
Hawaii	25.0	40	.....	.....	100.0	54.1	45.9	3.0	0.5	2.5
Honduras	80.0	375	59.1	.....	40.9	80.0*	20.0*	7.1	1.1	6.0
Jamaica	30.0	10	.....	.....	100.0	15.0*	85.0*	8.5	3.0	9.0
Mexico	15.1	48	47.2	33.7	19.1	80.0*	20.0*	.....	42.0	658.0
Newfoundland and Labrador	23.8	263	93.8	6.2	.....	100.0	.....	.....	20.3	47.0
Nicaragua	70.7	303	27.5	.....	72.5	90.0*	10.0*	10.0	2.0	8.0
Panama	60.0	275	.....	.....	100.0	90.0*	10.0*	4.6	0.6	4.0
Porto Rico	20.1	3	.....	.....	100.0	11.9	88.1	4.4	4.0	17.0
Salvador	17.8	7	16.2	.....	83.8	5.0*	95.0*	26.7	12.7	14.0
United States	28.9	52	61.8	38.2	.....	20.9	79.1	4,265.0	13,750.0	10,550.0
Virgin Islands	18.0	6	.....	.....	100.0	.....	100.0	0.3	.....	0.3
SOUTH AMERICA	44.0	325	5.2	5.5	89.3	.....	.....	1,653.9	258.6	2,232.9
Argentina	36.1	320	1.9	2.3	95.8	8.7	91.3	50.0	77.8	120.0
Bolivia	38.9	440	.....	11.0	89.0	78.1	21.9	8.6	2.6	6.0
Brazil	47.5	328	10.0	.....	90.0	100.0*	.....	1,300.0	100.0	1,200.0
British Guiana	86.9	1,595	.....	.....	100.0	98.8	1.2	4.6	.9	3.7
Chile	16.1	77	11.7	88.3	.....	90.0*	10.0*	.....	45.7	638.3
Colombia	53.8	270	.....	23.3	76.7	90.0*	10.0*	110.0	10.0	100.0
Dutch Guiana	90.0	2,900	.....	.....	100.0	100.0*	.....	1.5	0.6	0.9
Ecuador	76.0	288	.....	18.4	81.6	75.0*	25.0*	50.0	5.1	50.0
French Guiana	98.0	4,200	.....	.....	100.0	100.0*	.....	0.6	0.1	0.5
Paraguay	58.0	460	.....	.....	100.0	2.0	98.0	17.4	7.4	10.0
Peru	51.2	386	.....	10.7	89.3	90.0*	10.0*	50.0	.....	50.0
Uruguay	2.3	7	.....	.....	100.0	.....	100.0	21.4	3.5	18.5
Venezuela	41.2	365	.....	.....	100.0	70.0	30.0	39.9	4.9	35.0

* Estimated. No exact data available.

† This figure does not include vast areas of virgin tropical forest as well as much of the virgin forest of the temperate regions, because there are no data available and no attempts are made even to prevent or check devasta tion by fire. It will be noted that 22,586,500,000 cu. ft., or more than half of the world total, is given for the growth in Europe, where the forests are managed for the production of timber.

TABLE 24—UNITED STATES AND CANADA. LUMBER PRODUCTION

	A Lumber Cut in 1922, Millions of Board Feet	B Approximate Year of Maximum Cut, 1870–1922	C Lumber Cut in Maximum Year, Millions of Board Feet	D Production per 1,000 Inhabitants, 1922	E Production of 1922 in Per Cent of Maximum
UNITED STATES	31,569	1909	44,510	298	71
NORTHEASTERN	1,423	1899	5,709	44	25
Maine	362	1909	1,112	469	33
New Hampshire	181	1907	754	405	24
Vermont	96	1890	384	272	25
Massachusetts	95	1908	385	24	25
Connecticut	53	1909	168	37	32
New York	222	1880	1,184	21	19
New Jersey	10	1880	110	3	9
Pennsylvania	333	1899	2,333	37	14
Maryland	54	1909	268	36	20
Rhode Island	3	1907	33	5	9
Delaware	14	1909	55	61	25
CENTRAL	1,762	1899	5,643	69	31
Ohio	137	1899	990	23	14
Indiana	149	1899	1,037	50	14
Illinois	24	1899	388	4	6
Missouri	202	1899	724	59	28
West Virginia	554	1909	1,473	362	38
Kentucky	210	1907	913	86	23
Tennessee	486	1909	1,224	208	40
LAKE STATES	1,944	1899	8,750	214	22
Michigan	657	1890	4,300	169	15
Minnesota	512	1899	2,342	208	22
Wisconsin	776	1899	3,389	284	23
NORTH CAROLINA PINE STATES	2,409	1909	5,177	358	47
Virginia	617	1909	2,102	261	29
North Carolina	936	1914	2,228	353	42
South Carolina	855	1909	898	496	95
SOUTHERN STATES	11,975	1916	15,325	636	78
Georgia	809	1909	1,342	272	60
Florida	980	1916	1,425	956	69
Alabama	1,458	1919	1,799	606	81
Mississippi	2,268	1916	2,730	1,270	83
Arkansas	1,382	1909	2,111	770	66
Louisiana	3,386	1917	4,210	1,840	80
Texas	1,543	1907	2,230	318	69
Oklahoma	149	1916–17	240	70	62
ROCKY MOUNTAIN STATES	1,430	1920	1,699	416	84
Montana	303	1920	410	521	74
Idaho	858	1920	970	1,870	89
Arizona	89	1920	121	242	74
New Mexico	126	1922	126	343	100
Colorado	39	1904	142	40	27
Utah	7	1880	26	15	27
Wyoming	8	1911	33	39	24
PACIFIC STATES	10,581	1922	10,581	1,795	100
Washington	5,836	1922	5,836	4,130	100
Oregon	3,024	1920	3,317	3,750	91
California[1]	1,721	1922	1,721	468	100
ALL OTHER[2]	45	1890	615	.....	7
CANADA	2,869[3]	1911	4,918[4]	326	58
Alberta	26	.....	.....	44	
British Columbia	996	.....	.....	1,900	
Manitoba	62	.....	.....	102	
New Brunswick	270	.....	.....	700	
Nova Scotia	115	.....	.....	220	
Ontario	734	.....	.....	250	
Prince Edward Island	6	.....	.....	68	
Quebec	649	.....	.....	275	
Saskatchewan	11	.....	.....	15	

[1] Includes Nevada.
[2] Includes Iowa, Kansas, Nebraska, North Dakota and South Dakota.
[3] Figures for 1921.
[4] Maximum cut between 1908 and 1921.

TABLE 25—UNITED STATES: CHANGES IN LUMBER PRODUCTION

	Lumber Production, Millions of Board Feet			State of Greatest Production, 1922	State of Second Greatest Production, 1922
	1909	1919	1922		
	A	B	C	D	E
Softwoods:					
Yellow pine	16.3	3.1	11.5	Louisiana	Mississippi
Douglas fir	4.9	5.9	6.8	Washington	Oregon
Western yellow pine	1.5	1.8	2.1	California	Oregon
Hemlock	3.1	1.8	1.5	Washington	Wisconsin
White pine	3.9	1.7	1.4	Minnesota	Idaho
Cypress	1.0	0.7	0.9	Louisiana	Florida
Spruce	1.7	1.0	0.7	Washington	Oregon
Redwood	0.5	0.4	0.6	California	
Cedar	0.3	0.3	0.3	Washington	Oregon
White fir	0.1	0.2	0.3	California	Idaho
Larch	0.4	0.4	0.3	Montana	Idaho
Sugar pine	0.1	0.1	0.2	California	Oregon
Hardwoods:					
Oak	4.4	2.7	1.6	Arkansas	West Virginia
Red gum	0.7	0.9	0.8	Louisiana	Arkansas
Maple	1.1	0.9	0.6	Michigan	Wisconsin
Chestnut	0.7	0.5	0.3	West Virginia	Virginia
Yellow poplar	0.9	0.3	0.3	West Virginia	Tennessee
Birch	0.5	0.4	0.3	Wisconsin	Michigan
Beech	0.5	0.4	0.2	Michigan	Pennsylvania
Tupelo	0.1	0.1	0.2	Louisiana	Alabama
Elm	0.3	0.2	0.1	Wisconsin	Michigan
Basswood	0.4	0.2	0.1	Wisconsin	Michigan
Ash	0.3	0.2	0.1	Louisiana	Arkansas
Cottonwood	0.3	0.1	0.1	Mississippi	Minnesota

TABLE 26—WORLD: PRODUCTION

(Thousands of Metric

(See Note on

Continent and Country	A Aluminum	B Antimony	C Bauxite	D Coal	E Copper	F Gold, Thousands of Ounces	G Graphite	H Gypsum	I Iron Ore	J Pig Iron
WORLD TOTAL†	179.1	20.2	1,177.8	1,379,713.4	1,206.8	17,616.2	103.0	5,179.1	134,298.1	69,147.0
AFRICA (TOTAL)	.....	1.4	.....	11,552.6	6.4	10,100.8	13.1	.....	2,803.6	1.0
Algeria	.....	1.4	.....	8.9[1]	3.7	18.9[2]	.....	.....	1,490.1	.....
Angola	.....	.....	.....	.....	.....	6.0[2]	.....	.....	.....	.....
Belgian Kongo	.....	.....	.....	.....	.....	65.7[2]	.....	.....	71.3	.....
British West Africa	.....	.....	.....	173.4[1]	.....	203.6[2]	.....	.....	.....	.....
Egypt	.....	.....	.....	.....	.....	0.5	.....	.....	.....	.....
Eritrea	.....	.....	.....	.....	.....	0.5[2]				
Madagascar	.....	.....	.....	.....	.....	14.7[2]	13.0*	.....	.....	.....
Mauritius	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Morocco	.....	.....	.....	.....	.....	.....	.....	.....	396.7	.....
Rhodesia (etc.)	.....	.....	.....	560.0	2.7	647.5	.....	.....	.....	.....
Somaliland (British)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tunis	.....	.....	.....	0.6[1]	.....	.....	.....	.....	845.0	.....
Union of South Africa	.....	.....	.....	10,809.7	.....	9,143.4	.1	.....	0.5	1.0[2]
ASIA (TOTAL)	.....	14.7	5.0	74,404.6	54.1	938.7	30.9	41.3	2,507.1	985.1
Borneo (British)	.....	.....	.....	88.9[1]	.....	.....	.....	.....	.....	.....
Ceylon	.....	.....	.....	.....	.....	.....	10.7[1]	.....	.....	.....
China	.....	14.3[1]	.....	24,300.0[1]	.....	100.0[2]	.....	.....	1,270.0[2]	150.0[2]
Chosen	.....	.....	.....	317.3[1]	.....	75.0[2]	19.2[1]	.....	243.3	99.9
Cyprus	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Dutch East Indies	.....	.....	.....	1,000.0	.....	110.9	.....	.....	.....	.....
India (Total)	.....	.....	5.0[1]	19,316.1[1]	.....	383.7	10.7	41.3[1]	817.3	645.3
(British)	.....	.....	5.0[1]	19,316.1[1]	.....	383.7	.....	41.3[1]	817.3	645.3
(Portuguese)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Indo-China (French)	.....	.....	.....	989.0[1]	.....	.....	.....	.....	.....	.....
Japan	.....	.....	.....	29,150.0[1]	54.1[1]	255.5	1.0[3]	.....	19.9[2]	89.6
Malay States	.....	.....	.....	286.4	.....	13.4[2]	.....	.....	156.6	.....
Persia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Philippine Islands	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Russia in Asia	.....	.....	.....	1,276.9[1]	.....	3	.....	.....	.....	.3
Siam	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Turkey	.....	0.4[2]	.....	680.0[1]	.....	.....	.....	.....	.....	.....
AUSTRALASIA (TOTAL)	.....	0.7	.....	14,579.1	10.5	993.4	.....	54.3	572.1	55.8
Australia	.....	0.7	.....	12,691.5	10.5	869.0	.....	54.3	572.1	55.7
New South Wales	.....	.....	.....	10,347.1[1]	.6[1]	51.2[2]	.....	.....	181.3	55.7[1]
Queensland	.....	.....	.....	1,155.2	6.3	40.4[2]	.....	.....	0.2	.....
South Australia	.....	.....	.....	.....	3.6	2.6[2]	.....	54.3	390.6	.....
Tasmania	.....	.....	.....	82.0	.....	5.3[2]	.....	.....	.....	.....
Victoria	.....	0.7[1]	.....	661.7[1]	.....	104.5[2]	.....	.....	.....	.....
West Australia	.....	.....	.....	445.5[1]	.....	665.0[2]	.....	.....	.....	.....
New Zealand	.....	.....	.....	1,887.6[1]	.....	124.4[2]	.....	.....	.....	0.1[1]

* Estimated.

† The sum of the figures in this table. In most cases this total will not agree with the estimated production for a single year, because it is made up of figures for the latest available year for each country listed. It gives, however, a fairly accurate idea of the annual production.

[1] Data for 1922.

OF CHIEF MINERALS, 1923

(Tons, Except as Specified)

(Table A, Page 507)

K	L	M	N	O	P	Q	R	S	T	U	V	W
Lead Smelter Output	Mag-nesite	Man-ganese	Petroleum Thousands of Barrels	Phos-phate	Plati-num, Ounces	Pyrite	Salt	Silver, Thousands of Ounces	Sulphur	Tin	Tung-sten	Zinc Smelter Output
,213.0	597.2	1,151.1	1,005,358	6,422.1	66,167	2,643.2	21,294.4	238,490.5	1,988.8	126.3	8.34	1,006.2
25.3	1.2	196.6	1,037	3,164.4	.....	2.8	344.6	1,697.9	.....	7.3	.....	59 8[5]
.....	.....	1.9[2]	[4]	551.4	.....	.....	20.2[1]	150.0[2]	.....	.....	.....	47 8[5]
.....	.....	.....	.....	.....	.....	.....	0.4[1]	0.5[2]				
.....	.....	.....	.....	.....	.....	.....	0.1[1]	5.8[2]				
.....	.....	62.3[1]	.....	.....	.....	.....	1.5[1]	.....	.....	5.9		
.....	.....	132.4	1,037	25.4	.....	.....	186.8[1]					
.....	.....	.....	.....	5.2[1]	.....	.....	.....	12.9[2]				
.....	.....	.....	.....	.....	.....	.....	20.0*					
.....	.....	.....	.....	225.4	.....	.....	.....					
11.2	.....	.....	.....	.....	.....	.....	.....	155.2				
.....	.....	.....	.....	.....	.....	.....	1.6*					
14.1	.....	[7]	.....	2,357.0	.....	.....	52.0[1]	.....	.....	.....	.....	12.0[5]
.....	1.2	.....	.....	.....	.....	2.8	62.0[2]	1,373.5	.....	1.4		
50.9	20.5	505.6	52,657	12.3	.....	161.5	4,808.7	9,349.1	34.6	87.8	6.53	14.1
.....	.....	.....	3,387									
.....	.....	.....	.....	.....	.....	.....	39.6[1]					
.....	.....	19.2[1]	.....	.....	.....	.....	2,075.0*	40.0[2]	.....	8.7	4.5*	0.1[1]
.....	.....	.....	.....	.....	.....	.....	.....	1.0[2]				
.....	0.9[1]	.....	.....	.....	.....	.....	14.3[1]					
.....	.....	.....	15,000	.....	.....	.....	133.5[1]	1,409.0	.....	31.0		
46.5	19.6[1]	482.0[1]	7,575	.....	.....	.....	1,942.8[1]	4,244.3[1]	.....	2.2[1]	1.5*	
46.5	19.6[1]	482.0[1]	7,575	.....	.....	.....	1,891.2[1]	4,244.3[1]	.....	2.2[1]	1.5*	
.....	.....	.....	.....	.....	.....	.....	12.0*					
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	0.2*	
3.0	.....	4.4[1]	1,695	12.3	.....	161.5[1]	616.6[2]	3,554.8	34.6[1]	.....	0.2*	14.0
.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	39.6	0.1*	
.....	.....	.....	25,000									
.....	.....	.....	.....	.....	[3]	.....	.....	[3]				
.....	.....	.....	.....	.....	.....	.....	26.5[1]	.....	.....	6.3	0.03*	
1.4	.....	.....	.....	.....	.....	.....	.....	100.0[2]				
									.....	1.3	0.08	40.9
124.8	4.1	0.3	.....	10.5	.....	8.1	51.1	9,446.4	.....	1.3	0.05	40.9
124.8	4.1	0.3	.....	.5	.....	8.1	51.1	8,992.8	.....	.....	0.02*	
211.0[6]	3.4[1]	.....	.....	.....	.....	.....	.....	8,326.0[2]				
5.6[6]	.....	0.1	.....	.....	.....	.....	.....	195.5[2]				
.....	0.6[1]	0.2	.....	.5	.....	.....	51.1	1.4[2]	.....	1.2	0.03	40.9
4.9	.....	.....	.....	.....	.....	8.1	.....	348.7[2]	.....	.1[1]		
.....	0.1[1]	.....	.....	.....	.....	.....	.....	5.2[2]				
.....	.....	.....	.....	.....	.....	.....	.....	116.2[2]				
.....	.....	.....	.....	10.0*	.....	.....	.....	453.6[2]	.....	.....	0.03*	

[2] Data for 1921.
[3] Asiatic and European Russia together.
[4] Algeria and Tunis together.
[5] Zinc ore (not included in totals).
[6] Lead ore.
[7] See Algeria.

TABLE 26—WORLD: PRODUCTION OF

Continent and Country	A Aluminum	B Antimony	C Bauxite	D Coal	E Copper	F Gold, Thousands of Ounces	G Graphite	H Gypsum	I Iron Ore	J Pig Iron
EUROPE (TOTAL)	65.6	2.6	487.2	680,753.9	95.6	273.0	53.1	264.2	56,885.7	26,257.6
Austria	4.0*	0.2	2.7	2,816.6	4.8	.....	9.4	.....	1,210.0	341.9
Belgium	.....	.....	.....	28,705.9[3]	.....	.....	.....	.....	87.5	2,148.0
Bulgaria	.....	.....	.....	1,063.7						
Czechoslovakia	.....	.....	.....	27,827.2	.....	11.4[4]	13.0*	.....	313.1[3]	917.7[4]
Finland	.....	.....	.....	.....	.....	.....	.....	.....	1.2[3]	37.3
France	12.0*	2.2	314.3	38,543.7	0.1	.....	.....	.....	23,428.2	5,431.8
Germany	13.0*	.....	6.0*	259,315.2[4]	17.0*	4.8	24.6[4]	.....	5,790.3[4]	6,604.0[4]
Greece	.....	.....	.....	126.0	.....	0.5[4]	.....	2.5	100.1	.....
Hungary	.....	.....	.....	7,717.6[3]	.....	.....	.....	.....	43.9[3]	117.0[3]
Italy	1.5*	0.2	98.2	1,165.9	0.3	0.5[4]	5.6	.....	295.5	247.2
Luxemburg	.....	.....	.....	.....	.....	.....	.....	.....	4,097.5	1,406.7
Netherlands	.....	.....	.....	5,498.6	.....	.....	.....	.....	.....	.....
Norway	14.0*	.....	.....	.....	8.0*	.....	.....	.....	258.8[3]	1.9[3]
Poland	.....	.....	.....	36,098.0	.....	.....	.....	.....	450.2	547.3
Portugal	.....	.....	.....	132.5	5	.....	.....	.....	10.4[4]	.....
Rumania	.....	.....	12.0*	2,366.1	.....	.....	.....	.....	99.3	39.1
Russia	.....	.....	.....	8,914.6[3]	2.0*	250.7[3]	.....	.....	962.4[3]	166.8[3]
Spain	0.1	.....	.....	7,029.4	51.8[5]	0.9	0.5[3]	.....	3,456.2	400.3
Spitzbergen	.....	.....	.....	340.9						
Sweden	.....	.....	.....	3,378.9[3]	4.7	0.2[4]	.....	.....	5,597.7	264.3[3]
Switzerland	12.0*	.....	.....	.....	.....	.....	.....	.....	47.0[3]	.....
United Kingdom[1]	9.0*	.....	4.0*	253,613.1[3]	0.1[3]	.....	.....	261.7[3]	11,049.8	7,559.9
Yugoslavia	.....	.....	50.0*	4,000.0	6.8	4.0[4]	.....	.....	244.6	26.4
NORTH AMERICA (TOTAL)	113.5	0.2	553.4	596,776.7	782.3	4,675.2	5.9	4,819.3	71,239.6	41,903.1
Alaska	.....	.....	.....	.....	30.6	310.0	.....	.....	.....	.....
Canada[2]	16.5*	.....	.....	14,500.4	36.5	1,262.4[3]	1.0	507.8	27.9	894.0
Costa Rica	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cuba	.....	.....	.....	.....	10.9	.....	.....	.....	685.2	.....
Greenland	.....	.....	.....	2.1[3]						
Mexico	.....	0.2[3]	.....	949.7[3]	53.4	688.8[4]	2.1[3]	.....	.....	.....
Newfoundland	.....	.....	.....	.....	.....	.....	.....	.....	1,200.0	
Panama	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
United States[2]	97.0*	.....	553.4	581,324.5	650.9	2,413.0	2.8[3]	4,311.5	69,326.5	41,009.1
SOUTH AMERICA (TOTAL)	.....	0.6	132.2	1,647.5	257.9	635.1	.....	.....	290.0	.2
Argentina	.....	.....	.....	.....	.....	3.6[4]	.....	.....	.....	.....
Bolivia	.....	0.6[3]	.....	.....	10.7	0.4	.....	.....	.....	.....
Brazil	.....	.....	.....	324.2	.....	134.5[4]	.....	.....	.4	.2
British Guiana	.....	.....	112.2	.....	.....	12.8	.....	.....	.....	.....
Chile	.....	.....	.....	1,053.0[3]	203.3	64.4	.....	.....	289.6	.....
Colombia	.....	.....	.....	.....	.....	275.7	.....	.....	.....	.....
Dutch Guiana	.....	.....	20.0*	.....	.....	12.1[4]	.....	.....	.....	.....
Peru	.....	.....	.....	249.5[3]	43.9	120.4	.....	.....	.....	.....
Venezuela	.....	.....	.....	20.8[3]	.....	11.2[4]	.....	.....	.....	.....

* Estimated.
[1] Including Ireland.
[2] See Table 24 for production by states and provinces.
[3] Data for 1922.

CHIEF MINERALS, 1923—*Continued*

K	L	M	N	O	P	Q	R	S	T	U	V	W
Lead Smelter Output	Magnesite	Manganese	Petroleum Thousands of Barrels	Phosphate	Platinum, Ounces	Pyrite	Salt	Silver, Thousands of Ounces	Sulphur	Tin	Tungsten	Zinc Smelter Output
308.6[1]	510.4	80.3	54,906	179.6	24,341	2,274.1	9,192.0	7,981.6	297 0	0.1	1.43	401.1
4.3	427.6[3]	2.0	.....	.....	.....	.....	88.0[3]	15.0[3]	23.1[4]			
51.1	.....	.....	.....	56.8[3]	.....	.....	.....	.....	.....	.....	.....	148.1
.....	.....	.....	.....	.....	.....	.....	128,2[3]	703.1[4]				
14.0	.....	0.3	503	113.8[4]	.....	186.4	1,145.4	321.5[4]	.....	.....	.....	43.9
63.7[3]	.....	3.4[4]	354	.....	.....	414.4[4]	2,680.4[3]	3,215.0	.....	.....	0.2*	48.0
4.2	57.8	.....	.....	.....	.....	52.3	59.9	192.9[1]	2.2	.....	.....	4.07
17.1	13.3	9.2	32	.....	.....	493.4	790.3[3]	199.3[4]	243.9	.....	.....	3.7
.....	.....	.....	.....	.....	.....	.....	28.3*	.....	.....	.....	.....	16.4
.....	0.8	.....	.....	.....	.....	396.4[3]	.....	323.2[1]	.....	.....	.....	2.0
10.3[3]	.....	.....	5,000	.....	.....	.....	295.4[3]	.....	.....	.....	.....	95.0*
.....	.....	0.4[4]	.....	.....	.....	173.0[3]	.....	.....	.....	.....	0.5*	
0.5[3]	.....	.....	10,850	.....	.....	.....	285.2[3]					
4.3	10.6[3]	31.6[3]	38,167	3.6[3]	24,341[3,6]	5.4[3]	789.5[3]	192.9[6]	.....	.....	.....	0.27
127.5	0.3	28.6	.....	5.4	.....	489.0	617.2	2,778.2	22.8	0.1	0.03	10.8
0.2	.....	4.5[3]	.....	.....	.....	57.3	.....	13.3[4]	.....	.....	.....	1.4
.....	.....	.....	.....	.....	.....	.....	339.0[4]					
6.8	.....	0.3[3]	.....	.....	.....	6.5[3]	1,901.3[3]	11.3[4]	.....	.....	0.7	31.8
8.5	.....	.....	.....	.....	.....	.....	43.9[3]	15.9[4]				
702.7	58.5	27.6	882,907	3,055.3	1,826	196.7	6,715.5	182,746.5	1,644.9	.....	0.23	490.3
.....	.....	.....	.....	.....	.....	.....	.....	648.0				
48.9	7.9[3]	0.1[3]	175	0.2[3]	1,217	12.1	184.1	18,626.4	.....	.....	.....	27.2
.....	.....	0.6[4]										
.....	.....	12.6[3]										
121.6	.....	0.6[4]	149,472	.....	.....	.....	67.0*	90,859.1	.....	.....	0.03	18.5[7]
.....	.....	.....	.....	.....	.....	.....	0.8[3]					
532.2	50.6[3]	13.7[3]	733,260	3,055.1	609	184.6	6,463.6	72,573.0	1,644.9	.....	0.2	462.1
.7	2.5	340.7	13,851	.....	40,000	.....	182.5	27,269.0	12.3	29.8	0.07	
.....	.....	.....	3,250	.....	.....	.....	93 7[3]	25.0[4]	.....	.....	0.01[3]	
.....	.....	.....	.....	.....	.....	.....	.....	5,212.8	.....	29.8	0.01[3]	
.....	.....	340.7[3]	.....	.....	.....	.....	.....	33.0[4]				
.....	.....	.....	.....	.....	.....	.....	33.7[3]	3,337.5	12.3			
.....	.....	.....	426	.....	40,000	.....	29.0*	3.2				
0.7	.....	.....	6,375	.....	.....	.....	26.1[3]	18,654.8	.....	.....	0.02[3]	
.....	2.5[4]	.....	3,800	.....	.....	.....	.....	2.7[4]				

[4] Data for 1921.
[5] Spain and Portugal together.
[6] Asiatic and European Russia together.
[7] Zinc ore (not included in totals).

TABLE 27—UNITED STATES AND CANADA. PRODUCTION OF CHIEF MINERALS, 1923

(All figures are in thousands except as noted). (Notice that the short ton of 2000 pounds and the long ton of 2240 pounds are used here, while in Table 26 the metric ton of 2205 pounds is used.)

	A Coal, Short Tons	B Petroleum, Barrels	C Iron Ore, Long Tons	D Pig Iron, Long Tons	E Portland Cement, Barrels	F Stone Sold, Short Tons	G Copper Smelter Output, Pounds	H Gold, Fine Ounces	I Silver, Fine Ounces	J Natural Gas, Millions of Cubic Feet	K Lead,† Short Tons	L Sand and Gravel, Short Tons	M Zinc,† Short Tons	N Salt, Short Tons	O Clay Sold, Short Tons
UNITED STATES (TOTALS)	640,844	733,260	69,351	40,361[9]	137,460[11]	102,886	1,435,000[10]	2,413	72,573	763*	545.6	[12]139,932[13]	610.4	7,125[14]	3,435[12]
Alabama	18,200	.....	6,783	2,997	3,497	1,299	.....	.....	.....	.....	.....	1,830	.....	.....	91
Arizona	.....	.....	.....	.....	.....	286	615,494	293	7,229	.....	8.1	.....	.3	.....	.....
Arkansas	1,400	36,610	.....	.....	.....	517	.....	.....	.....	10	.....	1,572	.1	.....	.....
California	[1]	263,729	3	.....	11,002	7,623	27,043	655	3,741	85	4.8	7,206	.....	252	282
Colorado	10,300	86	4	.....	11	543	4,343	314	5,607	.....	21.2	186	26.8	.....	190
Connecticut	.....	.....	.....	14	.....	1,483	.....	.....	.....	.....	.....	691	.....	.....	1
Delaware	.....	.....	.....	.....	.....	84	.....	.....	.....	.....	.....	53	.....	.....	5
Florida	.....	.....	.....	.....	.....	1,494	.....	.....	.....	.....	.....	513	.....	.....	.....
Georgia and other minor producers[1]	250[1]	.....	117	.....	11	564	.....	.....	.....	.....	.....	595	.....	.....	319
Idaho	[1]	.....	1	.....	.....	175	3,664	36	7,832	.....	121.2	97	14.0	.....	.....
Illinois	84,009	8,707	.....	3,839	7,148	9,112	.....	.....	8	3	1.4	11,951	1.3	.....	166
Indiana	27,000	1,043	.....	.....	11	3,650	.....	.....	.....	1	.....	10,918	.....	.....	80
Iowa	6,500	.....	.....	.....	5,732	604	.....	.....	.....	.....	.....	3,597	.....	.....	5
Kansas	4,500	28,250	.....	.....	6,026	920	.....	.....	.....	20	17.6	1,950	101.0	845	.....
Kentucky	41,000	8,069	.....	7	11	1,884	.....	.....	.....	6	.1	2,102	.3	.....	102
Louisiana	.....	24,919	.....	.....	.....	.....	.....	.....	.....	70	.....	2,906	.....	359	.....
Maine	.....	.....	.....	.....	.....	307	.....	.....	.....	.....	.....	532	.....	.....	.....
Maryland	2,700	.....	.....	806[6]	11	1,244	.....	.....	.....	.....	.....	2,044	.....	.....	87
Massachusetts	.....	.....	.....	4	.....	1,789	.....	.....	.....	.....	.....	1,814	.....	.....	1
Michigan	1,200	[3]	14,174	3,813	7,620	10,716	137,691	.....	254	.....	.....	9,602	.....	2,127	4
Minnesota	.....	.....	44,348	725[8]	11	702	.....	.....	.....	.....	.....	3,826	.....	.....	.....
Mississippi	.....	.....	.....	7	.....	.....	.....	.....	.....	.....	.....	2,772	.....	.....	2
Missouri	3,800	183	54	.....	7,306	2,135	.....	.....	145	.....	169.7	3,719	18.3	.....	496
Montana	3,300	2,782	18	.....	11	276	224,354	85	14,192	.....	13.0	365	70.7	.....	12
Nebraska	.....	.....	.....	.....	11	244	.....	.....	.....	.....	.....	1,930	.....	.....	.....
Nevada	.....	.....	10	.....	.....	84	63,496	195	10,507	.....	9.1	269	7.1	.....	1
New Hampshire	.....	.....	.....	.....	.....	122	.....	.....	.....	.....	.....	505	.....	.....	.....
New Jersey	.....	.....	308	[5]	11	2,040	.....	.....	.....	.....	.....	6,101	75.2	.....	377

New Mexico	2,700	[3]	205	.....	.....	397	57,521	24	778	.....	1.9	464	8.2	1	3
New York	.....	1,250	542	2,952[5]	6,990	7,044	.....	.....	.....	7	.....	10,730	8.5	2,066	8
North Carolina	1	.....	60	.....	.....	1,397	.....	.....	.....	.....	.....	2,053	.....	.....	24
North Dakota	950														
Ohio	40,000	7,085	.....	9,348	4,189	11,493	.....	.....	.....	51	.....	10,127	.....	1,102	313
Oklahoma	3,550	160,929	.....	.....	[11]	1,266	.....	.....	.....	141	66.9	1,404	242.4		
Oregon	1	.....	.....	.....	[11]	1,103	.....	23	64	.....	.....	1,702	.....	.....	1
Pennsylvania	255,444[2]	7,609	993	14,805	38,157	15,679	.....	.....	1	101	.....	9,221	.....	.....	517
Rhode Island	.....	.....	.....	.....	.....	161	.....	.....	.....	.....	.....	70			
South Carolina	.....	.....	.....	.....	.....	848	.....	.....	.....	.....	.....	581	.....	.....	55
South Dakota	1	.....	.....	.....	.....	251	.....	304	93	.....	.....	305			
Tennessee	6,100	8	267	291	[11]	1,454	.....	.....	108	.....	1.3	1,868	15.9	.....	105
Texas	1,100	131,023	.....	[7]	4,179	2,201	.....	.....	820	48	.....	5,060	.....	.....	4
Utah	4,600	.....	58	.....	[11]	785	210,118	158	20,276	.....	101.7	1,212	5.7	81	4
Vermont	.....	.....	.....	.....	.....	343	.....	.....	.....	.....	.....	56			
Virginia	11,000	.....	156	6	[11]	2,216	.....	.....	.....	.....	.....	2,194	.....	.....	14
Washington	2,950	.....	.....	.....	2,106	679	839	15	220	.....	1.5	3,789	1.5	.....	10
West Virginia	100,100	6,358	.....	702[7]	[11]	2,551	.....	.....	.....	195	.....	2,438	.....	32	76
Wisconsin	.....	.....	871	[8]	.....	2,488	.....	.....	.....	.....	.7	5,022	13.2		
Wyoming	8,200	44,785	379	.....	.....	186	88	.....	.....	23	.....	1,377	.....	.....	1
CANADA (TOTALS)[15]	15,158	175	16	383	5,765	3,637	42,880[16]	1,263	18,626	14,681	46.6[16]	11,666	28.1	182	
Alberta[15]	5,991	6	.....	.....	.....	1	.....	.....	.....	5,867					
British Columbia[15]	2,927	.....	.....	.....	.....	198	31,936	207	7,151	.....	43.5	.....	23.1		
Manitoba[15]	.....	.....	.....	.....	.....	34	.....								
New Brunswick[15]	288	8	.....	.....	.....	12	.....	.....	.....	754					
Nova Scotia[15]	5,569	.....	.....	121	.....	88	.....	1	.....	.....	.....	.....	5		
Ontario[15]	.....	161	.....	262	3,104	2,317	10,944	1,000	10,812	8,060	1.4	.....	.....	177	
Quebec[15]	.....	.....	.....	.....	2,661	987	.....								
Saskatchewan[15]	382	.....	.....	.....											
Yukon[15]	1	.....	.....	.....	.....	.....	.....	55	663	.....	1.7				

* Estimated.

† Mine production of recoverable metal.

[1] Includes estimate for Alaska, California, Idaho, North Carolina, Oregon, and South Dakota.

[2] Bituminous, 160,000,000 tons; anthracite, 95,444,000 tons.

[3] Figure for Missouri includes data for Alaska, Michigan, and New Mexico.

[4] Figure for Connecticut includes Massachusetts.

[5] Figure for New York includes New Jersey.

[6] Figure for Maryland includes Virginia.

[7] Figure for West Virginia includes Kentucky, Mississippi and Texas.

[8] Figure for Minnesota includes Wisconsin.

[9] Includes West of Mississippi, 321,436 tons.

[10] Includes East and South, 20,122,867 lbs.; other States, 1,186,700 lbs.

[11] Includes other States, 33,508,233 lbs., as indicated by ([11]).

[12] Includes undistributed, 76,101 tons.

[13] Includes, undistributed, 611,478 tons.

[14] Includes, undistributed, 258,845 tons for Idaho, Nevada, Texas and Virginia.

[15] All Canadian figures are for 1922.

[16] Figures for ore.

TABLE 28—UNITED STATES. PRINCIPAL MINERAL INDUSTRIES, 1919

The term "coal" here means bituminous coal. Petroleum includes natural gas. Under each state name the first figure shows the percentage of the gainfully employed population engaged in mineral industries; the second is the total of column D for the industries here shown.

A.	B. Mineral Industries Employing Largest Number Wage Earners.	C. Number thus Employed.	D. Per Cent of those Employed in Mining.	A.	B. Mineral Industries Employing Largest Number Wage Earners.	C. Number thus Employed.	D. Per Cent of those Employed in Mining.
Ala.	Coal	24,648	75.7	Nebr.	(Negligible)		
3.9	Iron ore	6,485	19.9	0.01			
98.2	Limestone	835	2.6	Nev.	Gold, silver	2,084	49.3
Ariz.	Copper	14,237	93.2	16.5	Copper, lead, zinc	1,884	44.5
11.8	Gold, silver	642	4.2	94.3	Quicksilver	23	0.5
98.1	Lead, zinc	101	0.7	N. H.	Granite	589	86.4
Ark.	Coal	2,787	76.8	2.1			
0.9	Limestone	114	3.1	N. J.	Clay	868	19.0
80.7	Lead, zinc	28	0.8	0.3	Basalt	637	13.9
Calif.	Petroleum	12,344	63.8	38.5	Limestone	258	5.6
1.6	Gold, silver	3,983	20.6	N. Mex.	Coal	3,564	50.2
89.9	Copper	1,055	5.5	6.0	Gold, silver, copper, lead, zinc	3,057	43.1
Colo.	Coal	11,252	67.0	93.3			
6.4	Gold, silver	3,495	208.	N. Y.	Iron ore	1,811	29.2
93.4	Lead, zinc	936	5.6	0.2	Limestone	1,739	28.0
Conn.	Basalt	363	66.9	71.2	Petroleum	868	14.0
0.01, 83.8	Granite	92	16.9	N. Car.	Granite	959	50.7
Del. 0.01	(Negligible)	..	..	0.2	Mica	274	14.5
Fla.	Phosphate rock	2,330	69.1	73.9	Feldspar	164	8.7
0.8	Fuller's earth	717	21.3	N. Dak.	Coal	774	
93.7	Limestone	111	3.3	0.6			
Ga.	Granite	580	24.2	Ohio	Coal	40,452	82.1
0.2	Clay	465	19.4	2.6	Petroleum	5,123	10.4
54.7	Barytes	265	11.1	97.1	Limestone	2,262	4.6
Idaho	Lead, zinc	1,820	74.1	Okla.	Petroleum	21,180	62.5
3.4	Gold, silver	349	14.2	5.6	Coal	7,040	20.8
91.8	Copper	87	3.5	98.8	Lead, zinc	5,253	15.5
Ill.	Coal	73,780	93.2	Ore.	Gold, silver, copper	423	57.2
3.3	Petroleum	2,752	3.5	0.7	Basalt	124	16.8
98.3	Limestone	1,244	1.6	83.3	Limestone	69	9.3
Ind.	Coal	24,479	91.5	Pa.	Coal	154,992	47.9
3.0	Limestone	1,800	6.7	9.7	Anthracite	147,372	45.6
99.7	Petroleum	403	1.5	96.3	Petroleum	9,065	2.8
Iowa	Coal	10,584	93.9	R. I. 0.0	Granite	262	71.0
1.7	Gypsum	444	3.9	S. Car.	Granite	322	34.5
100.0	Limestone	246	2.2	0.1			
Kans.	Coal	8,084	50.1	S. Dak.	Sandstone	89	
3.3	Petroleum	6,305	39.1	0.7			
96.3	Lead, zinc	1,141	7.1	Tenn.	Coal	9,556	66.0
Ky.	Coal	39,769	91.3	2.1	Phosphate rock	1,568	10.8
6.0	Petroleum	2,119	4.9	85.7	Copper, lead, zinc	1,282	8.9
97.8	Limestone	676	1.6	Texas	Petroleum	13,599	74.9
La.	Petroleum	4,873	63.5	1.8, 89.8	Coal	2,711	14.9
1.1	Sulphur*	.....	..	Utah	Gold, silver, copper, zinc, lead	5,874	59.7
*	Limestone*	.....	..				
Me. 2.4	Granite	747	76.3	6.8	Coal	3,647	37.0
Md.	Coal	4,826	85.7	98.2	Limestone	148	1.5
1.1	Granite	235	4.2	Vt.	Granite	1,062	36.2
93.2	Basalt	183	3.3	1.4	Slate	1,039	35.4
Mass.	Granite	1,034	60.7	91.0	Marble	570	19.4
0.1, 92.8	Basalt	547	32.1	Va.	Coal	11,215	77.1
Mich.	Iron ore	16,160	51.6	2.0	Limestone	777	5.3
1.9	Copper	12.235	39.1	86.7	Iron ore	623	4.3
96.0	Coal	1,654	5.3	Wash.	Coal	4,413	87.4
Minn.	Iron ore	16,236	94.0	1.5	Gold, silver, copper, lead, zinc	221	4.4
1.7	Granite	392	2.3	1.5			
98.3	Manganese	347	2.0	93.8	Basalt	99	2.0
Miss. 0.0	(Negligible)			W. Va	Coal	87,095	86.42
Mo.	Coal	7,285	49.0	21.1	Petroleum	12,302	12.0
1.6	Lead, zinc	4,793	32.3	99.6	Limestone	1,003	1.
89.2	Limestone	1,171	7.9	Wis.	Iron ore	1,145	32.3
Mont.	Gold, silver, copper, lead, zinc	11,862	73.6	0.4	Lead, zinc	1,078	30.4
				83.9	Granite	753	21.2
7.8	Coal	3,797	23.5	Wyo.	Coal	7,091	73.1
97.6	Limestone	87	0.5	10.8, 95.4	Petroleum	2,167	22.3

* Data not published because only one enterprise reports for each, and the census is not allowed to disclose individual operations.

TABLE 29.—WORLD: THE COTTON-SPINNING INDUSTRY, 1923, AND WATER POWER, 1920

	A Thousands of of Cotton Spindles	B Spindles per 1,000 People	C Potential Water Power in 1920, in Thousands of Horse-Power	D Developed Water Power in 1920, in Thousands of Horse-Power	E Percentage of Potential Water Power Developed up to 1920
WORLD	157,775	.....	445,000	23,000.0	5.200
AFRICA	.....	.....	190,000	11.2	0.006
Abyssinia	.....	.....	4,000		
Algeria	.....	.....	200	0.1	0.050
Angola	.....	.....	4,000	4.0	0.100
Belgian Congo	.....	.....	90,000	0.3	
British East Africa	.....	.....	7,400	1.7	0.023
British West Africa	.....	.....	12,150		
Cameroon (French)	.....	.....	13,000		
Egypt	.....	.....	600		
French Equatorial Africa	.....	.....	35,000		
French West Africa	.....	.....	6,100		
Liberia	.....	.....	4,000		
Madagascar	.....	.....	5,000	0.1	0.002
Morocco	.....	.....	250		
Mozambique	.....	.....	3,700		
Nyassaland	.....	.....	1,200		
Rhodesia, etc.	.....	.....	2,520		
Tunis	.....	.....	30		
Union of South Africa	.....	.....	1,660	5.0	0.312
ASIA	14,888	.....	78,200	1,229.4	1.570
Afghanistan	.....	.....	500	2.0	4.000
Asia Minor	.....	.....	500	0.5	0.100
Borneo	.....	.....	2,500		
Celebes	.....	.....	1,000		
China, proper	2,680	6	20,000	1.7	0.009
Chosen	.....	.....	500	2.6	0.520
India	7,331	23	27,000	150.0	0.555
Indo-China (French)	.....	.....	4,000		
Japan, proper	4,877	85	6,000	1,000.0	16.666
Java	.....	.....	500	56.5	11.300
Persia	.....	.....	200		
Philippine Islands	.....	.....	1,500		
Siam	.....	.....	4,000[1]	4.5	0.113
Siberia	.....	.....	8,000		
Sumatra	.....	.....	2,000	11.6	0.580
AUSTRALASIA	.....	.....	9,420	79.5	0.845
Australia	.....	.....	620		
Tasmania	.....	.....	400	34.5	8.620
New Guinea	.....	.....	5,000		
New Zealand	.....	.....	3,800	45.0	1.186
EUROPE	100,883	.....	45,000	8,877.0	19.727
Albania	.....	.....	500	1.0	0.200
Austria	1,023	159	3,000	205.0	6.833
Belgium	1,683	225	.....	.7	60.000 ?
Bulgaria	.....	.....	1,200	8.0	0.667
Czecho-slovakia	3,508	258	420	50.0	11.905

[1] Includes Malay States.

TABLE 29.—WORLD: THE COTTON-SPINNING INDUSTRY, 1923, AND WATER POWER, 1920—*Continued*

	A Thousands of Cotton Spindles	B Spindles per 1,000 People	C Potential Water Power in 1920, in Thousands of Horse-Power	D Developed Water Power in 1920, in Thousands of Horse-Power	E Percentage of Potential Water Power Developed up to 1920
EUROPE—*Continued*					
Denmark	.....	.....	2	1.5	75.000
Esthonia	576	518	200[2]	20.0	10.000
Finland	241	71	1,500	185.0	12.320
France	9,600	251	4,700	1,400.0	29.800
Germany	9,605	160	1,350	1,000.0	74.000
Greece	.....	.....	250	6.0	2.400
Hungary	.....	.....	150	30.0	20.000
Iceland	.....	.....	500	?	?
Italy	4,570	118	3,800	1,150.0	30.250
Netherlands	669	96			
Norway	.....	.....	5,500	1,350.0	24.550
Poland	1,200	45	200	80.0	40.000
Portugal	487	81	300	10.0	33.333
Rumania	.....	.....	1,100	30.0	2.725
Russia	7,246	70	7,425[3]	145.0	1.950
Spain	1,813	85	4,000	600.0	15.000
Sweden	566	95	4.500	1,200.0	26.700
Switzerland	1,513	389	1,400	1,070.0	76.400
United Kingdom	56,583	1,200			
Yugoslavia	.....	.....	2,600	125.0	4.800
NORTH AMERICA	39,554	.....	68,000	12,210.0	17.980
Alaska	.....	.....	1,000	40.0	4.000
Canada	1,375	153	20,000[4]	2,418.0[4]	12.090
Costa Rica	.....	.....	1,000	15.0	1.500
Guatemala	.....	.....	1,500	4.0	0.267
Honduras	.....	.....	1,000	3.0	0.300
Mexico	770	53	6,000	400.0	6.667
Newfoundland	.....	.....	400	60.0	15.000
Nicaragua	.....	.....	800	0.4	0.050
Panama	.....	.....	500	13.3	2.660
Salvador	.....	.....	200	2.7	1.350
United States	37,409	338	35,000[4]	9,243.0[4]	26.400
SOUTH AMERICA	1,700	.....	54,000	424.0	0.786
Argentina	.....	.....	5,000	25.0	0.500
Bolivia	.....	.....	2,500	12.0	0.480
Brazil	1,700	56	2,000	250.0	1.000
British Guiana	.....	.....	2,500		
Chile	.....	.....	2,500	60.0	2.400
Colombia	.....	.....	4,000	25.0	0.625
Dutch Guiana	.....	.....	800		
Ecuador	.....	.....	1,000	2.5	0.250
French Guiana	.....	.....	500		
Paraguay	.....	.....	2,000	0.2	0.001
Peru	.....	.....	4,500	36.5	0.812
Uruguay	.....	.....	300		
Venezuela	.....	.....	3,000	12.5	0.417

[2] Includes Latvia and Lithuania.
[3] Includes Ukraine and Caucasus.
[4] Later data in Table 30.

TABLE 30—UNITED STATES AND CANADA. THE COTTON SPINNING INDUSTRY, 1923, AND WATER POWER, 1924

	A	B	C	D	E	F
	Thousands of Cotton Spindles	Spindles per 1,000 People	Potential Water Power Available 90% of the Time, Thousands of Horse-Power	Potential Water Power Available 50% of the Time, Thousands of Horse-Power	Developed Water Power, Thousands of Horse-Power	E as Percentage of C
UNITED STATES	37,409					
Alabama	1,330	566	472	1,050	216	46
Arizona	.....	.....	2,759	2,887	39	1
Arkansas	.....	.....	125	178	1	1
California	.....	.....	4,603	6,674	1,452	31
Colorado	.....	.....	765	1,570	88	12
Connecticut	1,367	989	65	110	136	209*
Delaware	.....	.....	5	10	3	60
Florida	.....	.....	10	18	7	70
Georgia	2,694	930	572	958	364	64
Idaho	.....	.....	2,122	4,032	271	13
Illinois	62	10	189	361	85	45
Indiana	84	29	40	110	29	73
Iowa	.....	.....	169	395	177	105*
Kansas	.....	.....	104	251	15	14
Kentucky	96	40	77	184	1	1
Louisiana	101	56	1	2		
Maine	1,141	1,488	536	1,074	473	88
Maryland	131	90	106	238	7	6
Massachusetts	11,951	3,100	106	235	344	324*
Michigan	.....	.....	168	274	282	168*
Minnesota	.....	.....	203	401	212	104*
Mississippi	179	100	30	60		
Missouri	.....	.....	67	152	18	27
Montana	.....	.....	2,550	3,700	345	13
Nebraska	.....	.....	183	342	20	11
Nevada	.....	.....	300	370	14	5
New Hampshire	1,450	3,260	186	350	236	127*
New Jersey	447	142	50	90	19	38
New Mexico	.....	.....	116	186	1	1
New York	1,037	100	4,010	4,960	1,543	39
North Carolina	5,509	2,160	540	816	432	80
North Dakota	.....	.....	82	193		
Ohio	.....	.....	55	166	30	55
Oklahoma	.....	.....	70	194	2	3
Oregon	.....	.....	3,665	6,715	207	56
Pennsylvania	203	23	257	638	170	66
Rhode Island	2,877	4,760	25	40	30	120*
South Carolina	5,132	3,055	429	632	358	83
South Dakota	.....	.....	63	110	18	29
Tennessee	439	188	432	710	128	30
Texas	176	38	238	514	14	6
Utah	.....	.....	1,420	1,586	115	8
Vermont	145	412	80	169	168	210*
Virginia	673	292	459	812	110	24
Washington	.....	.....	4,970	7,871	480	10
West Virginia	.....	.....	355	980	15	4
Wisconsin	.....	.....	285	480	404	14
Wyoming	.....	.....	704	1,182	8	11
CANADA	.....	.....	18,255	.....	2,974	16
Alberta	.....	.....	475	1,138	33	7
British Columbia	.....	.....	1,931	5,103	329	17
Manitoba	.....	.....	3,270	5,769	134	4
New Brunswick	.....	.....	50	121	42	84
Nova Scotia	.....	.....	21	128	47	223*
Ontario	.....	.....	4,950	6,808	1,299	26
Prince Edward Island	.....	.....	3	5	2	67
Quebec	.....	.....	6,915	11,640	1,074	16
Saskatchewan	.....	.....	513	1,088		
Yukon	.....	.....	125	275	13	10

* Percentages above 100 mean that the capacity of the water wheels now installed is beyond the actual capacity of the water when the streams are low, or even at all times. The same dam, for instance, may serve more than one mill, each of which is equipped to use all the water.

TABLE 31.—UNITED STATES. GENERAL STATISTICS OF MANUFACTURING INDUSTRIES, 1919

State.	A. Number of Establishments.	B. Persons Engaged in Manufacture.	C. Average Number of Wage Earners.	D. Average Number of Wage Earners per Establishment.	E. Number of Simple Industries, 1914.	F. Number of Complex Industries, 1914.	G. Number of Complex for Each Simple Industry, 1914.	H. Value of Products, Millions of Dollars.	I. Values Added by Manufacturer, Millions of Dollars.	J. Per Cent of Total Value Added by Manufacturer.	K. Value Added by Manufacture, per Capita, Dollars.	L. Value Added per Person Engaged in Manufacturing, Dollars.
Alabama	3,654	120,889	107,159	29	25	41	1.6	493	192	39	82	1600
Arizona	480	10,347	8,528	18	11	12	1.1	121	28	23	84	2220
Arkansas	3,123	58,202	49,954	16	17	19	1.1	200	98	49	56	1675
California	11,942	296,997	243,792	20	32	131	4.1	1981	763	38	222	2570
Colorado	2,631	44,729	35,254	13	18	51	2.8	276	101	36	107	2250
Connecticut	4,872	338,033	292,672	60	19	104	5.5	1392	706	51	512	2090
Delaware	668	32,972	29,035	43	16	28	1.8	165	80	48	366	2420
Florida	2,582	82,986	74,415	29	21	24	1.1	213	121	57	124	1450
Georgia	4,803	141,012	123,441	26	20	47	2.4	693	253	36	87	1790
Idaho	922	16,268	13,917	15	12	12	1.0	81	37	45	85	2240
Illinois	18,593	804,755	653,114	35	36	187	5.2	5425	1937	36	298	2410
Indiana	7,916	330,145	277,580	35	28	111	4.0	1940	724	38	246	2195
Iowa	5,683	105,439	80,551	14	17	71	4.2	745	225	30	94	2135
Kansas	3,474	77,010	61,049	18	19	44	2.3	914	164	18	93	2120
Kentucky	3,957	83,954	69,340	18	23	51	2.2	396	160	41	64	1910
Louisiana	2,619	112,523	98,265	38	21	40	1.9	676	245	36	136	2175
Maine	2,995	99,284	88,651	30	22	54	2.5	457	202	44	263	2040
Maryland	4,937	165,869	140,342	29	25	88	3.5	874	325	37	224	1960
Massachusetts	11,906	812,527	713,836	60	24	180	7.7	4011	1750	44	468	2160
Michigan	8,305	549,069	471,242	57	29	112	3.5	3460	1547	45	422	2820
Minnesota	6,225	147,678	115,623	19	18	89	4.9	1218	335	28	140	2270
Mississippi	2,455	64,452	57,560	24	17	27	1.7	198	101	51	56	1570
Missouri	8,592	245,739	195,837	23	26	109	4.2	1599	539	34	158	2195
Montana	1,290	20,692	17,160	13	13	21	1.6	167	45	27	81	2145
Nebraska	2,884	49,076	36,521	13	13	37	2.8	596	115	19	89	2345
Nevada	166	3,563	3,119	19	8	9	1.1	23	6	28	82	1790
New Hampshire	1,499	90,332	83,074	55	17	44	2.6	407	168	41	380	1860
New Jersey	11,059	603,427	508,921	46	29	145	5.0	3676	1405	38	450	2325
New Mexico	387	6,646	5,736	15	7	13	1.9	18	10	57	28	1565
New York	49,333	1,525,314	1,228,369	25	33	228	6.9	8867	3923	45	378	2580
North Carolina	5,999	175,423	157,659	26	21	39	1.9	944	417	44	163	2375
North Dakota	894	6,148	4,472	5	7	14	2.0	57	13	22	20	2100
Ohio	16,125	882,934	730,733	45	35	163	4.7	5100	2188	43	380	2490
Oklahoma	2,445	38,314	29,503	12	17	28	1.6	401	89	22	44	2315
Oregon	2,707	68,005	58,559	22	20	46	2.3	367	161	44	204	2360
Pennsylvania	27,974	1,324,121	1,136,210	41	34	215	6.3	7317	3106	43	357	2345
Rhode Island	2,466	156,012	139,665	56	14	68	4.9	747	331	44	550	2120
South Carolina	2,004	86,360	79,450	40	17	25	1.6	381	153	40	91	1780
South Dakota	1,414	9,034	6,382	5	9	16	1.8	62	19	31	30	2125
Tennessee	4,589	113,300	95,167	21	22	47	2.2	556	211	38	90	1860
Texas	5,724	130,911	107,522	19	23	55	2.5	1000	299	30	64	2285
Utah	1,160	23,107	18,868	16	19	44	1.8	157	47	30	104	2025
Vermont	1,790	38,845	33,491	19	15	34	2.3	168	73	43	204	1875
Virginia	5,603	139,178	119,352	21	25	52	2.1	644	272	42	118	1950
Washington	4,918	150,479	132,928	27	19	58	3.1	810	366	45	270	2435
West Virginia	2,785	93,688	83,036	30	24	35	1.4	472	201	43	137	2145
Wisconsin	10,393	317,899	263,949	25	25	99	4.0	1847	720	39	273	2260
Wyoming	576	8,095	6,634	12	5	10	2.0	81	39	48	40	4840
United States	290,111	10,815,883	9,098,119	31	..	...	...	62,428	25,048	40	237	2310

TABLE 32.—UNITED STATES. DISTRIBUTION AND RELATIVE IMPORTANCE OF INDUSTRIES, 1919

Under each state the first figure shows the per cent of the gainfully employed population engaged in industry; the second is the total of column D.

A.	B. Industries Employing Largest Number Wage Earners.	C. Number Thus Employed.	D. Per Cent of Those Employed in Manufacturing.
Ala.	Lumber mills	25,778	24.1
17	Cotton goods	18,102	16.9
49.1	Railroad shops	8,665	8.1
Ariz.	Smelting and refining, copper	3,112	36.5
18	Railroad shops	2,103	24.7
72.6	Lumber mills	972	11.4
Ark.	Lumber mills	30,429	60.9
12	Railroad shops	4,691	9.4
73.6	Cottonseed oil and cakes	1,661	3.3
Calif.	Shipbuilding	46,052	18.9
28	Canning and preserving	19,575	8.0
33.9	Lumber mills	16,957	7.0
Colo.	Railroad shops	5,739	16.3
20	Foundry and machine shop, products	2,189	6.2
27.7	Slaughtering and meat-packing	1,848	5.2
Conn.	Brass, bronze, and copper products	29,580	10.1
54	Foundries and machine shops	20,148	6.9
22.3	Cotton goods	15,647	5.3
Del.	Leather, tanned, curried and finished	4,251	14.6
38	Railroad shops	3,223	11.1
30.8	Pulp goods	1,485	5.1
Fla.	Lumber mills	21,058	28.3
26	Tobacco, cigars and cigarettes	12,393	16.6
60.7	Turpentine and rosin	11,748	15.8
Ga.	Cotton goods	38,283	31.0
16	Lumber mills	13,375	10.8
48.5	Railroad shops	8,210	6.7
Idaho	Lumber mills	8,291	59.6
16	Railroad shops	1,877	13.5
75.8	Printing and publishing	371	2.7
Ill.	Slaughtering and meat-packing	54,179	8.3
33	Foundries and machine shops	45,879	7.0
21.5	Railroad shops	40,219	6.2
21.5	Railroad shops	23,099	8.3
Ind.	Iron and steel works	22,362	8.1
32	Foundry and machine shop, products	18,828	6.8
23.2	Railroad shops	13,536	1.8
Iowa	Slaughtering and meat-packing	7,134	8.9
20	Foundry and machine-shop, products	3,529	4.4
30.1	Slaughtering and meat-packing	17,805	29.2
Kans.	Railroad shops	11,196	18.3
19	Flour-mills and grist-mills	3,493	5.7
53.2	Railroad shops	12,372	17.8
Ky.	Lumber mills	7,716	11.1
17	Men's clothing	2,590	3.7
32.6	Lumber mills	42,194	42.9
La.	Sugar, including refining	7,698	7.8
20	Railroad shops	4,424	4.5
55.2			

A.	B. Industries Employing Largest Number Wage Earners.	C. Number Thus Employed.	D. Per Cent of Those Employed in Manufacturing.
Maine	Paper and wood pulp	13,058	14.7
39	Cotton goods	11,763	13.3
39.2	Boots and shoes	9,919	11.2
Md.	Shipbuilding	17,212	12.3
34	Men's clothing	9,256	6.6
24.9	Railroad shops	8,363	6.0
Mass.	Cotton goods	122,499	17.2
51	Boots and shoes	80,166	11.2
33.5	Worsted goods	36,296	5.1
Mich.	Automobiles	126,937	26.9
42	Automobile bodies and parts	49,048	10.4
45.7	Foundries and machine-shops	39,430	8.4
Minn.	Railroad shops	15,976	13.8
22	Lumber mills	12,602	10.9
30.0	Foundries and machine-shops	6,183	5.3
Miss.	Lumber mills	35,512	61.7
10	Railroad shops	4,030	7.0
73.0	Turpentine and rosin	2,495	4.3
Mo.	Boots and shoes	17,458	9.0
25	Railroad shops	13,471	6.9
20.8	Foundries and machine-shops	9,530	4.9
Mont.	Railroad shops	5,312	31.0
15	Lumber mills	3,693	21.5
57.3	Printing and publishing	829	4.8
Nebr.	Slaughtering and meat-packing	10,122	27.7
18	Railroad shops	6,178	16.9
48.8	Printing and publishing	1,522	4.2
Nev.	Railroad shops	1,750	56.1
19	Slaughtering and meat-packing	118	3.8
63.2	Printing and publishing	103	3.3
N. H.	Cotton goods	21,183	25.5
51	Boots and shoes	12,336	14.8
46.7	Woolen goods	5,317	6.4
N. J.	Shipbuilding	50,251	9.9
48	Silk goods	32,326	6.4
21.4	Electrical machinery and supplies	26,135	5.1
N. Mex.	Railroad shops	2,993	52.2
13	Lumber mills	1,240	21.6
78.3	Printing and publishing	257	4.5
N. Y.	Women's clothing	102,652	8.4
39	Men's clothing	62,008	5.0
18.0	Foundries and machine-shops	56,609	4.6
N. Car.	Cotton goods	67,297	42.7
23	Lumber mills	22,728	14.4
64.5	Tobacco, cigars and cigarettes	11,683	7.4
N. Dak.	Railroad shops	1,539	34.4
9	Flour-mill and grist-mill products	568	12.7
59.6	Printing and publishing	557	12.5
Ohio	Iron and steel works	73,025	10.0
42	Foundries and machine-shops	72,227	9.9
28.6	Rubber goods	63,637	8.7

TABLE 32.—*Continued*

A.	B. Industries Employing Largest Number Wage Earners.	C. Number Thus Employed.	D. Per Cent of Those Employed in Manufacturing.	A.	B. Industries Employing Largest Number Wage Earners.	C. Number Thus Employed.	D. Per Cent of Those Employed in Manufacturing.
Okla.	Petroleum refining	4,612	15.6	Utah	Railroad shops	3,318	17.6
15	Railroad shops	2,687	9.1	22	Sugar, beet	2,214	11.7
32.4	Smelting and refining zinc	2,272	7.7	38.6	Smelting, lead	1,749	9.3
Ore.	Lumber mills	22,884	39.1	Vt.	Marble and stone work	5,400	16.1
27	Foundries and machine-shops	3,265	5.6	32	Woolen and worsted goods	3,031	9.1
49.8	Shipbuilding	2,990	5.1	34.2	Lumber mills	3,020	9.0
Pa.	Iron and steel works	171,715	15.1	Va.	Lumber mills	15,960	13.4
42	Railroad shops	78,749	6.9	23	Railroad shops	12,086	10.1
28.3	Foundries and machine-shops	71,087	6.3	29.6	Tobacco, cigars and cigarettes	7,335	6.1
R. I.	Cotton goods	31,405	22.5	Wash.	Lumber mills	53,393	40.2
59	Worsted goods	21,249	15.2	31	Shipbuilding	29,391	22.1
45.3	Jewelry	10,579	7.6	67.2	Railroad shops	6,480	4.9
S. Car.	Cotton goods	48,079	60.5	W. Va.	Lumber mills	12,427	15.0
16	Lumber mills	11,713	14.7	24	Glass	11,668	14.1
78.7	Fertilizers	2,765	3.5	43.1	Iron and steel works	11,630	14.0
S. Dak.	Railroad shops	1,222	19.1	Wis.	Lumber mills	21,795	8.2
12	Automobile repairing	794	12.4	34	Foundries and machine-shops	18,635	7.1
42.0	Lumber mills	673	10.5	22.0	Engines, steam, gas and water	17,782	6.7
Tenn.	Lumber mills	12,847	13.5	Wyo.	Railroad shops	3,057	46.1
18	Knit goods	10,308	10.8	19	Automobile repairing	363	5.5
35.0	Railroad shops	10,173	10.7	56.4	Lumber mills	322	4.8
Texas	Lumber mills	17,359	16.1				
16	Railroad shops	16,703	16.0				
39.8	Petroleum refining	8,224	7.7				

TABLE 33.—UNITED STATES. MOTOR-TRUCK HAULS FROM FARMS TO SHIPPING POINTS, 1918,

Region.	Average Haul in Miles.	Average Number Round Trips per Day.	Average Load.			Average Cost of Hauling One Ton One Mile.		
			Corn. Bushels.	Wheat. Bushels.	Cotton. Bales.	Corn. Cents.	Wheat. Cents.	Cotton. Cents.
United States.....	11.3	3.4	58	84	6.6	15	15	18
New England....	10.0	4.5	62	60	....	11	14	.....
Middle Atlantic...	12.2	3.4	69	78	....	14	14	.....
East North Central	9.3	4.8	64	90	....	11	9	.....
W. North Central.	10.1	3.8	54	84	....	18	14	.....
South Atlantic....	9.8	4.0	45	57	6.0	19	18	20
East South Central	12.9	3.2	58	86	7.6	12	10	13
West South Central	13.0	2.9	57	72	6.7	17	15	20
Mountain.....	21.0	1.2	48	70	....	36	29	.....
Pacific.....	12.3	2.9	74	105	....	20	17	.....

TABLE 34.—UNITED STATES. WAGON-HAULS FROM FARMS TO SHIPPING POINTS, 1918

Region.	Average Haul in Miles.	Average Number Round Trips per Day.	Average Load.			Average Cost of Hauling One Ton One Mile.		
			Corn. Bushels.	Wheat. Bushels.	Cotton. Bales.	Corn. Cents.	Wheat. Cents.	Cotton. Cents.
United States.....	9.0	1.2	39	56	3.6	33	30	48
New England....	7.2	1.8	38	45	....	39	38	.....
Middle Atlantic...	7.6	1.6	39	47	....	39	38	.....
East North Central	6.3	2.0	41	54	....	29	26	.....
W. North Central.	7.9	1.5	42	57	....	33	29	.....
South Atlantic...	8.4	1.4	29	36	3.5	41	39	48
East South Central	10.4	1.0	26	38	3.2	45	36	52
W. South Central.	10.9	1.0	26	46	3.8	49	32	47
Mountain.....	20.2	0.4	46	66	....	52	42	.....
Pacific.....	11.2	1.4	71	67	....	23	22	.....

TABLE 35—WORLD. RAILWAYS, TELEGRAPHS, AND POST OFFICES

(1922 or Nearest Available Date)

	A	B	C	D	E	F	G	H
	Railway Mileage, Total	Railway Mileage per 10,000 Inhabitants	Railway Mileage per 1,000 Square Miles	Miles of Telegraph Wire, Total, 1924	Miles of Telegraph Wire per 10,000 Inhabitants	Miles of Telegraph Wire per 1,000 Square Miles	Post Offices, Total	Post Offices per 10,000 Inhabitants
Algeria	2,722	.5	12	25,283	44	114	707	1.2
Argentina	21,935	25	19	175,875	202	154	3,645	4.2
Australia	26,202	47	9	97,438	173	33	8,395	14.9
Austria	4,125	6	134	49,009	76	1,595	3,118	4.8
Belgian Congo	1,263	1	1	2,636	2	3	50	0.03
Belgium	5,686	8	485	27,695	37	2,460	1,769	2.4
Bolivia	1,401	5	2	6,957	24	11	427	1.5
Brazil	17,907	6	6	95,463	31	30	4,044	1.3
Bulgaria	1,829	4	45	15,200	31	372	2,555	5.2
Canada	39,771	4	11	270,782	306	74	12,252	13.8
Chile	5,102	13	17	38,090	100	130	966	2.5
China	6,818	0.2	4	87,000	2	57	35,464	0.8
Chosen	1,157	1	12	16,660	10	172	577	0.3
Colombia	926	1	2	14,413	23	32	843	1.3
Costa Rica	410	8	22	2,740	57	147	307	6.3
Cuba	3,020	10	68	10,618	37	240	749	2.6
Czechoslovakia	8,718	6	161	45,339	33	832	4,753	3.5
Denmark	3,092	9	182	9,352	28	547	1,975	6.0
Dominican Republic	408	5	21	907	10	47	83	0.9
Dutch East Indies	2,011	0.4	0.3	20,297	4	28	603	1.3
Ecuador				4,622	23	39	?	
Egypt	3,065	2	252	23,067	17	1,900	2,992	2.2
Esthonia	769	7	42	5,348	48	290	179	1.6
Finland	2,660	8	18	10,294	30	68	2,632	7.7
Formosa	396	1	29	3,043	8	221	171	0.5
France	33,568	9	153	495,000	126	2,325	15,769	4.0
Germany	35,209	6	193	484,514	81	2,645	42,458	7.0
Great Britain and N. Ireland	20,292	5	214	299,301	68	3,162	23,773	5.0
Greece	1,983	3	40	23,535	39	478	1,047	1.8
Guatemala	478	2	12	4,447	22	119	423	2.1
Haiti	112	1	10	124	1	11	92	0.5
Honduras	556	8	12	4,663	70	101	285	4.3
Hungary	4,493	6	125	51,080	64	1,425	2,449	3.1
India, British	37,265	1	20	347,295	11	190	19,557	0.6
Indo-China (French)	1,265	1	5	22,161	12	80	361	0.2
Irish Free State	3,525	11	130	23,205	74	857	(H)	
Italy	12,885	3	107	255,000	66	2,125	12,039	3.2
Japan	8,475	1	57	162,397	28	1,092	8,025	1.4
Latvia	1,825	10	72	5,647	30	222	352	1.9
Mexico	16,442	11	21	76,105	53	99	2,701	1.9
Morocco	840	1	4	13,227	22	60		
Netherlands	2,370	3	180	32,716	47	2,480	1,731	2.5
New Zealand	3,156	3	30	23,067	183	223	2,188	1.6
Nicaragua	169	3	34	3,637	57	73	180	2.8
Norway	2,141	8	17	20,138	76	161	4,125	15.7
Panama	301	7	9	3,618	83	112	96	2.2
Paraguay	308	3	3	1,841	18	19	385	3.9
Persia	350	0.4	0.6	12,507	13	20	201	0.2
Peru	1,997	3	4	10,401	14	20	821	1.1
Philippine Islands	803	0.7	7	9,200	8	80	907	0.8
Poland	9,541	4	64	109,151	40	734	3,858	1.4
Porto Rico	339	3	100	1,061	8	312	92	0.7
Portugal	2,128	4	60	18,700	31	527	7,922	13.1
Rumania	7,325	5	64	48,308	30	425	4,662	2.9
Russia	42,504	4	24	345,707	34	190	19,104	1.9
Salvador	260	2	20	2,374	16	180	176	1.2
Siam	1,376	1	7	6,530	7	34	379	0.4
Spain	9,842	5	50	80,730	38	414	9,454	4.4
Sweden	9,439	16	54	51,967	87	300	4,313	7.2
Switzerland	3,586	9	226	25,318	65	1,592	4,268	11.2
Tunis	1,287	6	27	5,789	28	119	473	2.3
Turkey	3,340	2	12	37,231	26	131	1,268	0.9
Union of South Africa	10,890	16	23	44,912	65	95	2,795	4.0
United States	262,544	24	88	1,875,000	170	397	51,947	4.7
Uruguay	1,660	11	23	5,029	33	70	995	6.5
Venezuela	646	3	2	6,726	28	17	376	1.6
Yugoslavia	5,696	5	59	35,500	29	368	1,829	1.5

TABLE 36—WORLD. MOTOR VEHICLES, TELEPHONES, AND SHIPS

Continent and Country	A Motor Vehicles, 1924	B Persons per Motor Vehicle, 1924	C Telephones, January 1, 1924	D Telephones per 100 Inhabitants	E Tonnage of Sailing Vessels, 1922	F Tonnage of Steam and Motor Vessels, 1922
WORLD	21,360,779[2]	82	24,576,121	1.4	3,027,834	61,342,952
AFRICA	98,231[2]	1,450	139,631	0.1		
Algeria	14,600	398				
British East Africa	3,050	3,220				
British West Africa	7,150	3,200				
Egypt	7,233	1,870	30,863	0.2		
Morocco	5,600	1,070				
Tunis	3,706	564				
Union of South Africa	51,500	135	43,585	0.9		
ASIA	186,758[2]	4,925	761,419			
Arabia	465	10,800				
Ceylon	6,312	740				
China	10,000	43,600	101,425	0.03	.....	188,388
Chosen	1,122	15,360				
Dutch East Indies	35,950	1,310	38,587	0.1		
India (British)	63,500	3,900	38,850	0.01		
Indo-China (French)	5,750	3,300				
Japan	19,693	2,925	472,805	0.8	.....	3,586,918
Malay States	15,404	159				
Mesopotamia	1,470	1,935				
Palestine	855	900				
Persia	1,700	5,590				
Philippine Islands	14,828	735	15,000	0.1		
Siam	2,500	3,730				
Syria	3,044	985				
Turkey	2,600	5,580				
AUSTRALASIA	266,536[2]	.....	395,829			
Australia	205,000	27	281,703	5.0		
New Zealand	60,600	21	111,441	8.3		
EUROPE	2,115,541	225	6,390,765	1.3		
Austria	15,140	424	135,839	2.1		
Belgium	65,000	115	114,807	1.5	8,403	571,074
Bulgaria	1,003	4,860	7,283	0.1		
Czechoslovakia	11,700	1,167	103,606	0.7		
Denmark	47,500	69	292,770	8.7	74,996	963,142
Esthonia	743	1,490	.....	.....	13,110	32,149
Finland	5,462	624	80,000	2.3	90,717	122,954
France	573,967	68	603,786	1.5	308,410	3,537,382
Germany	216,300	277	2,242,332	3.8	101,641	1,785,767
Great Britain and N. Ireland	778,211	57	1,148,095	2.5	206,999	19088,638
Greece	5,500	1,080	5,400	0.1	10,523	667,604
Hungary	4,610	1,720	75,207	0.9		
Irish Free State	17,400	181	21,268	0.7		
Italy	89,712	443	142,603	0.4	167,613	2,698,722
Latvia	635	2,920	11,358	0.6	7,826	3,298
Lithuania	493	972				
Netherlands	31,004	224	193,268	2.7	15,228	2,617,485
Norway	20,467	129	167,008	6.1	183,181	2,417,680
Poland	7,963	3,405	110,143	0.4		
Portugal	9,000	670	18,859	0.3	48,539	237,339
Rumania	11,000	1,480	31,615	0.2	.....	72,297
Russia	25,000	4,100	130,278	0.1		
Spain	70,000	304	90,000	0.4	67,481	1,215,276
Sweden	63,000	95	402,389	6.7	75,343	1,040,032
Switzerland	29,848	130	180,280	4.6		
Yugoslavia	6,000	2,000	26,000	0.2	.....	81,204
NORTH AMERICA	18,483,000[2]	7	16,541,858	10.9		
Alaska	1,225	45				
Canada	636,489	14	1,009,203	10.0		
Central America[1]	2,120	1,790	18,018	0.3		
Cuba	33,124	87	47,786	1.5	7,498	55,179
Dominican Republic	2,100	427				
Haiti	1,000	722				
Hawaii	22,600	13	16,816	6.0		
Jamaica	2,985	290				
Mexico	35,000	414	50,360	0.4		
Newfoundland	870	304				
Panama	3,000	144				
Porto Rico	10,263	131	11,442	0.8		
Salvador	1,000	1,526				
United States	17,726,507	6	15,369,454	13.7	1,253,998	15,808,462
SOUTH AMERICA	210,713[2]	315	346,619	0.5		
Argentina	120,000	72	157,041	1.6	19,967	161,588
Bolivia	1,092	2,650	2,706	0.1		
Brazil	44,834	683	93,846	0.3	23,127	469,444
Chile	8,000	476	30,272	0.7	10,279	121,122
Colombia	3,000	2,100	11,463	0.2		
Ecuador	900	2,200	4,712	0.2		
Paraguay	310	3,200	392	0.03		
Peru	6,000	1,220	9,140	0.2	32,846	68,363
Uruguay	20,890	73	24,184	1.5	11,046	65,265
Venezuela	4,000	600	10,550	0.4		

[1] Includes Costa Rica, Guatemala, Honduras, Nicaragua.
[2] The totals include the following undistributed items: Africa, 1,857; Australasia, 936; Europe, 6,115; North America, 4,072; South America, 132.

TABLE 37.—UNITED STATES AND CANADA: RAILROADS, ELECTRIC ROADS, MOTOR VEHICLES AND TELEPHONES

	A	B	C	D	E	F	G	H	I	J
	Railroad Mileage, 1922	Miles of Railroad Line per 10,000 Inhabitants, 1922	Miles of Railroad Line per 10 Square Miles, 1922	Miles of Electric Railways, 1923	Passenger Cars and Trailers on Electric Railways, 1923	Passenger Cars on Electric Railways per 100,000 Inhabitants, 1923	Motor Vehicles, 1924	Persons per Motor Vehicle, 1924	Telephones, Jan. 1, 1925, Thousands	Telephones, per 100 Population, Jan. 1, 1925
UNITED STATES	250,413	22.9	.....	47,283	82,672	75	17,726,507	6.3	16,072.5	
Alabama	5,354	22.2	.....	362	564	23	157,262	15.6	101.6	4.1
Arizona	2,452	67.0	.....	44	49	13	57,828	6.8	27.7	6.8
Arkansas	5,033	27.8	.....	126	247	14	141,983	13.0	108.9	5.9
California	8,282	22.4	.....	3,364	4,325	117	1,321,480	3.0	953.3	23.7
Colorado	5,170	52.8	.....	454	546	56	213,247	4.7	163.1	16.0
Connecticut	999	6.9	.....	1,601	1,705	118	214,318	6.6	240.2	15.6
Delaware	335	14.7	.....	140	263	115	35,136	6.6	25.4	10.8
Florida	5,284	51.5	.....	200	379	37	194,196	5.5	106.9	9.8
Georgia	7,173	24.1	.....	498	739	25	209,300	14.5	151.6	5.0
Idaho	2,878	62.7	.....	100	33	7	69,225	7.0	50.1	10.2
Illinois	12,030	17.9	.....	3,587	6,710	100	1,123,724	6.1	1,437.4	20.6
Indiana	7,197	24.0	.....	2,430	2,073	69	650,219	4.6	517.5	16.9
Iowa	9,838	40.0	.....	575	874	36	620,906	4.0	556.6	22.2
Kansas	9,385	52.3	.....	508	415	23	410,891	4.4	370.7	20.2
Kentucky	3,955	16.1	.....	492	836	34	231,784	10.7	219.6	8.8
Louisiana	5,065	27.6	.....	315	779	42	178,000	10.4	108.7	5.8
Maine	2,247	29.1	.....	528	436	56	127,178	6.1	124.6	13.4
Maryland	1,448	9.7	.....	702	2,144	144	195,581	7.8	174.2	11.3
Massachusetts	2,103	5.3	.....	2,711	5,503	138	672,315	6.5	796.0	19.3
Michigan	8,549	21.9	.....	1,828	3,167	81	868,587	4.7	582.1	14.0
Minnesota	8,812	35.6	.....	782	1,260	51	502,987	5.4	435.9	17.0
Mississippi	4,235	23.6	.....	94	129	7	134,547	13.4	68.4	3.8

Missouri	8,059	23.4	.....	1,146	2,806	82	544,635	6.3	595.9	17.2
Montana	5,040	84.7	.....	845	140	17	79,695	7.9	55.1	8.5
Nebraska	6,181	46.6	.....	242	606	46	308,713	4.4	282.8	20.8
Nevada	2,161	280.0	.....	8	5	6	18,387	4.2	11.1	14.3
New Hampshire	1,239	22.4	.....	244	307	69	71,929	6.2	77.9	17.3
New Jersey	2,314	7.0	.....	1,465	3,144	95	504,190	6.8	474.5	13.5
New Mexico	2,959	80.3	.....	11	16	4	41,750	8.9	19.0	5.0
New York	8,398	7.8	.....	5,428	19,025	178	1,412,879	7.5	2,136.9	19.2
North Carolina	5,382	20.4	.....	364	330	12	305,756	9.0	135.1	4.9
North Dakota	5,281	79.7	.....	26	70	11	117,061	5.8	80.4	11.7
Ohio	8,872	14.7	.....	3,998	4,839	80	1,244,000	5.0	1,005.7	15.8
Oklahoma	6,600	31.1	.....	362	314	15	342,982	6.4	240.9	10.8
Oregon	3,338	41.0	.....	765	807	99	192,629	4.3	160.8	19.0
Pennsylvania	11,427	12.7	.....	4,625	8,097	90	1,228,586	7.5	1,211.0	13.0
Rhode Island	211	3.4	.....	400	1,285	208	90,652	7.0	105.8	16.6
South Carolina	3,765	21.8	.....	148	199	12	163,382	10.8	58.4	3.3
South Dakota	4,276	65.7	.....	20	27	4	142,280	4.6	106.6	16.0
Tennessee	4,022	16.9	.....	445	774	32	204,680	11.8	192.7	7.9
Texas	16,151	33.2	.....	1,037	1,467	30	834,040	6.0	525.6	10.3
Utah	2,145	.....	.....	505	261	.....	79,233	6.1	56.8	11.5
Vermont	1,060	.....	.....	99	112	.....	61,179	5.8	57.0	16.2
Virginia	4,695	.....	.....	447	922	.....	261,643	9.3	163.6	6.7
Washington	5,479	.....	.....	1,035	1,217	.....	294,812	4.9	258.9	17.5
West Virginia	4,047	.....	.....	611	451	.....	190,134	8.3	136.0	8.5
Wisconsin	7,472	.....	.....	768	1,151	.....	525,221	5.3	495.5	16.4
Wyoming	1,959	.....	.....	22	14	.....	43,639	5.0	26.8	12.1
CANADA	39,773	.....	.....	[2]	[2]	.....	513,821 [1]			
Alberta	4,364	.....	.....	.....	.....	.....	40,642	11.6*	67.6	9.3
British Columbia	4,680	.....	.....	.....	.....	.....	34,526	12.4*	89.3	12.5
Manitoba	5,585	.....	.....	.....	.....	.....	42,200	11.6*	67.0	8.5
New Brunswick	1,947	.....	.....	.....	.....	.....	13,746	22.6*	28.3	7.0
Nova Scotia	1,451	.....	.....	.....	.....	.....	16,159	26.1*	39.3	7.4
Ontario	10,881	.....	.....	.....	.....	.....	240,933	9.8*	476.1	15.3
Prince Edward Island	278	.....	.....	.....	.....	.....	2,167	32.8*	4.2	4.9
Quebec	4,977	.....	.....	.....	.....	.....	61,995	30.8*	208.6	7.9
Saskatchewan	6,267	.....	.....	.....	.....	.....	61,367	9.9*	98.1	10.6

* Estimated on basis of 1924 total.

[1] Data for 1922, see Table 34.

[2] Data for electric railroads in Canada not available.

TABLE 38—WORLD. FOREIGN COMMERCE, 1923

Continent and Country	A Total Imports, Thousands of Dollars	B Imports per Capita, Dollars	C Imports from United States, Thousands of Dollars	D Percentage of Imports from United States	E Imports from United States per Capita, Dollars	F Total Exports, Thousands of Dollars	G Exports per Capita	H Exports to United States, Thousands of Dollars	I Percentage of Exports to United States	J Exports to United States, per Capita, Dollars	K Number of Times by Which Imports Exceed Exports	L Number of Times by Which Exports Exceed Imports
WORLD (TOTAL)												
AFRICA (TOTAL)												
Algeria[2]	155,644	26.80	6,154	4.0	1.06	111,747	19.25	1,329	1.2	0.24	1.4	
Belgian Congo[2]	18,092	1.20	324	1.8	0.02	22,632	1.50	873	3.9	0.06	.....	1.3
Egypt	212,445	16.90	7,988	3.8	0.59	273,961	20.30	34,003	12.4	2.52	.....	1.3
Eritrea (1913)	3,948	8.80	11	0.3	0.04	2,237	5.00	20	1.1	0.07	1.8	
Liberia[2]	1,502	1.00	156	10.4	0.10	1,045	0.70	41	2.7	0.03	1.4	
Libia (1913)	44,625	8.90	78	0.2	0.02	8,968	1.80	119	1.3	0.02	5.0	
Morocco[1]	80,922	13.50	6,508	8.0	1.08	23,542	3.80	105	0.4	0.02	3.4	
Portuguese colonies[3, 4]	31,849	4.25	7,192	22.8	0.96	17,028	2.30	1,761	9.7	0.25	1.9	
Sudan	21,908	3.70	447	2.0	0.08	12,022	2.05	1,432	11.9	0.24	1.8	
Tunis[2]	70,234	33.60	5,166	7.4	2.46	36,470	17.40	760	2.1	0.36	1.9	
Union of South Africa	253,139	36.10	33,058	7.7	4.77	365,501	51.10	11,414	3.2	1.65	.....	1.4
ASIA (TOTAL)												
China	780,821	1.80	134,900	5.8	0.31	619,726	1.40	211,800	29.2	0.48	1.3	
Chosen[1]	112,121	6.50	6,935	6.2	0.40	105,315	6.10	146	0.1	0.06	1.1	
Dutch East Indies[2]	266,052	5.65	12,298	4.6	0.26	437,408	9.30	36,885	8.4	0.78	.....	1.6
Formosa	56,932	15.60	1,578	2.8	0.43	75,465	20.60	3,677	4.9	1.00	.....	1.3
French Indo-China[2]	68,839	3.60	1,179	1.8	0.06	91,205	4.80	406	0.5	0.02	.....	1.3
India (British)	706,132	2.20	37,719	5.3	0.12	1,018,786	3.20	109,648	10.8	0.03	.....	1.4
Japan	963,057	16.70	248,741	25.8	4.30	703,382	12.20	294,237	41.8	5.10	1.4	
Persia	56,208	5.90	513	0.9	0.05	66,627	7.00	5,555	8.3	0.59	.....	1.2
Philippine Islands	87,800	8.10	50,654	57.7	4.65	120,753	11.10	85,355	70.7	7.80	.....	1.4
Siam	60,909	6.50	2,032	3.3	0.21	68,354	7.30	176	0.3	0.02	.....	1.1
Turkey[2]	43,116	2.95	7,713	17.9	0.53	14,866	1.00	1,154	7.8	0.08	2.9	
AUSTRALASIA (TOTAL)												
Australia	623,325	111.00	119,600	19.2	21.20	506,939	90.00	41,100	8.1	7.30	1.2	
New Zealand	198,943	157.00	31,945	16.1	25.20	210,292	168.50	16,155	7.7	12.80	.....	1.1
EUROPE (TOTAL)												
Austria	374,615	58.50	23,230	6.2	3.60	208,790	31.40	3,558	1.7	0.55	1.7	
Belgium	655,005	87.60	77,332	11.8	10.30	462,220	61.90	17,764	3.8	2.38	1.4	
Bulgaria	27,791	5.60	564	2.0	0.12	29,801	5.95	1,334	3.4	0.27	.....	1.1
Czechoslovakia	299,478	22.00	21,096	7.0	1.54	369,925	27.10	16,449	4.4	1.21	.....	1.2
Denmark	362,398	110.10	38,800	10.7	11.80	281,466	85.50	6,600	2.3	2.00	1.3	

Esthonia	27,050	24.40	989	3.7	0.89	16,556	14.90	212	1.3	0.19	1.6	
Finland	123,616	36.20	15,657	12.8	4.60	117,648	34.40	9,211	7.8	2.60	1.1	
France	1,982,926	50.50	307,038	15.5	7.85	1,850,571	47.20	151,459	8.2	3.86	1.1	
Germany	1,448,587	24.20	316,838	21.9	5.30	1,448,054	24.20	161,348	11.2	2.70	1.0	
Great Britain	5,016,699	123.50	966,000	19.3	23.80	4,051,135	99.90	391,000	9.7	9.65	1.2	
Greece	104,136	17.50	11,900	11.4	2.00	41,982	7.05	14,400	34.8	2.42	2.5	
Hungary	117,287	14.90	4,518	3.9	0.57	100,627	12.60	532	0.5	0.07	1.2	
Italy	791,404	20.30	212,570	26.9	5.45	508,913	13.10	69,600	13.7	1.80	1.6	
Latvia	40,891	22.10	1,179	2.9	0.64	31,252	16.90	758	2.4	0.41	1.3	
Lithuania	15,663	3.25	105	0.7	0.02	14,680	3.20	161	1.1	0.03	1.1	
Netherlands	785,617	112.60	100,104	12.7	14.30	509,566	73.00	27,156	5.3	3.90	1.5	
Norway	225,058	85.50	27,600	12.3	10.50	132,044	50.20	20,100	15.3	7.65	1.7	
Poland	215,479	7.95	33,065	15.3	1.23	230,748	8.50	1,335	0.6	0.48	.....	1.1
Portugal[3]	200,000*	33.20	8,600	4.3	1.42	60,000*	9.95	3,800	6.3	0.63	3.3	
Rumania	16,882	1.04	1,200	7.1	0.07	19,664	1.20	300	1.5	0.02	.....	1.2
Russia	92,187	0.89	22,775	24.7	0.22	105,914	1.02	1,521	1.4	0.01	.....	1.2
Spain	442,192	22.80	61,870	14.0	3.18	230,050	11.90	31,462	13.6	1.62	1.9	
Sweden	343,771	57.30	42,400	12.3	7.80	303,282	50.50	36,200	11.9	6.40	1.1	
Switzerland	401,980	103.20	32,096	8.0	8.25	309,929	79.50	34,953	11.3	9.00	1.3	
Yugoslavia[2]	87,120	7.25	3,048	3.5	0.25	49,919	4.15	232	0.5	0.02	1.7	
NORTH AMERICA (TOTAL)												
Canada	885,778	98.60	598,775	67.6	66.80	994,797	111.00	414,987	41.7	46.20	.....	1.1
Costa Rica[2]	8,345	17.20	3,819	45.8	7.90	14,224	28.30	7,943	55.8	16.15	.....	1.7
Cuba	267,628	92.00	192,400	72.2	66.30	418,120	144.00	376,400	90.0	129.90	.....	1.6
Dominican Republic[2]	14,317	15.95	11,086	77.4	12.35	15,231	17.00	6,863	45.1	7.60	.....	1.1
Guatemala	13,763	6.85	6,314	46.0	3.16	14,726	7.35	12,917	87.7	6.45	.....	1.1
Haiti	14,158	8.70	11,599	81.9	7.10	14,591	8.95	1,993	13.7	1.22	.....	1.0
Honduras	14,342	21.70	12,016	83.8	18.20	10,016	15.15	8,970	89.6	13.50	1.4	
Mexico[3]	178,239	12.40	133,035	74.6	9.20	202,664	14.00	178,867	88.3	12.35	.....	1.1
Nicaragua	5,124	8.05	4,127	80.5	6.45	7,903	12.40	5,618	71.1	8.80	.....	1.5
Panama	11,165	25.90	7,827	70.1	18.00	2,394	5.55	2,171	90.7	5.05	5.2	
Porto Rico	84,467	62.50	76,920	91.1	57.00	86,072	63.90	80,303	93.3	59.50	.....	1.0
Salvador[2]	8,842	5.80	4,878	55.3	3.20	16,214	10.60	3,748	23.1	2.46	.....	1.8
United States	3,792,066	35.80	.....	.....	.....	4,090,715	38.70	.....	.....	.....	.....	1.1
SOUTH AMERICA (TOTAL)												
Argentina[2]	564,244	65.00	129,206	22.9	14.90	553,087	63.80	65,281	11.8	7.50	1.0	
Bolivia[2]	13,774	4.75	2,602	18.9	0.90	24,587	8.50	722	3.4	0.25	.....	1.8
Brazil	230,784	7.60	45,600	19.9	1.50	333,091	10.75	143,200	43.0	4.70	.....	1.4
Chili	112,990	29.60	31,100	27.6	8.15	186,388	48.90	92,300	49.5	24.20	.....	1.7
Colombia	32,000*	5.10	22,300	70.0	3.55	54,000*	8.60	45,700	85.0	7.25	.....	1.7
Dutch Guiana, etc.[1]	10,826	64.50	3,846	35.5	23.00	6,682	40.00	2,469	37.0	14.80	1.6	
Ecuador[2]	9,284	7.15	4,272	46.0	5.50	12,807	7.60	5,013	39.1	3.40	.....	1.4
Paraguay	4,562	4.60	586	12.8	0.60	5,752	5.75	545	9.5	0.55	.....	1.3
Peru	58,812	8.05	23,815	40.5	3.25	99,673	13.70	39,653	39.8	5.40	.....	1.7
Uruguay	84,000	54.80	15,100	18.0	9.90	79,684	52.00	21,800	27.4	14.30	1.1	
Venezuela[2]	15,772	6.55	9,163	58.1	3.80	26,162	10.85	8,339	31.9	3.45	.....	1.7

* Estimate [1] 1921 data. [2] 1922 data. [3] 1920 data. [4] Includes all Portuguese colonies.

TABLE 39—WORLD: FOREIGN COMMERCE OF PRINCIPAL PORTS OR CUSTOM DISTRICTS 1923,

Continent, Country, and City	A Imports, Thousands of Dollars	B Exports, Thousands of Dollars	C Total Commerce, Thousands of Dollars
AFRICA:			
Egypt:			
Alexandria[1]	173,561	271,227	444,788
ASIA:			
British Colonies:			
Bombay[2]	261,884	303,444	565,328
Calcutta[2]	245,379	336,813	582,192
Singapore	300,139	260,479	560,618
China:			
Canton	60,783	74,267	135,050
Dairen	56,313	93,757	150,070
Shanghai	343,949	227,866	571,815
Tientsin	62,702	41,117	103,819
Japan[3]*:*			
Kobe	370,649	110,559	481,208
Osaka	57,354	140,914	198,268
Yokahama	251,086	290,935	542,021
AUSTRALIA[4]:			
Melbourne	211,436	139,726	351,162
Sydney	243,698	185,310	429,008
EUROPE:			
Belgium:			
Antwerp	536,589	453,547	990,136
France[5]*:*			
Bordeaux	121,703	95,685	217,388
Dunkirk	228,409	36,187	264,596
Havre	411,281	296,906	708,187
Marseille	351,607	389,997	741,604
Italy[6]*:*			
Genoa	886,761	140,366	1,027,127
Naples	173,271	62,311	235,582
Spain[7]*:*			
Barcelona	82,486	53,495	135,981
Bilbao	27,607	8,279	35,886
Valencia	17,107	18,892	35,999
United Kingdom:			
Belfast	41,360	9,792	51,152
Bristol	138,432	24,648	163,080
Cardiff	52,945	122,581	175,526
Glasgow	128,980	238,376	367,356
Grimsby	73,783	89,643	163,426
Harwich	155,814	19,582	175,396
United Kingdom (Cont.):			
Hull	298,635	168,164	466,799
Leith	82,124	35,630	117,754
Liverpool	1,115,224	1,323,112	2,438,336
London	1,759,082	890,498	2,649,580
Manchester	255,951	174,518	430,469
Southampton	153,003	179,220	332,223
Tyne ports	91,595	153,007	244,602
NORTH AMERICA:			
Canada:			
Montreal	188,624	185,293	373,917
Cuba:			
Havana	180,933	65,790	246,723
Mexico[6]*:*			
Tampico	20,340	30,751	51,091
Vera Cruz	41,606	19,001	60,607
United States:			
Galveston	32,962	530,540	563,502
Georgia	28,928	51,493	80,421
Maryland	91,836	93,436	185,272
Massachusetts	307,288	52,159	359,447
New Orleans	171,620	301,416	473,036
New York	1,797,820	1,518,852	3,316,672
Oregon	10,120	52,510	62,630
Philadelphia	219,710	106,508	326,218
San Francisco	166,685	160,432	327,117
Washington (Puget Sd.)	262,158	116,088	378,246
SOUTH AMERICA:			
Argentina[8]*:*			
Buenos Aires	560,457	232,315	792,772
Brazil:			
Rio de Janeiro	104,609	64,150	166,759
Santos	78,100	167,783	245,883
Chile:			
Antofagasta	11,237	43,030	54,267
Iquique	4,976	33,602	38,578
Valparaiso	67,534	4,235	71,769
Peru:			
Callao	34,674	23,378	58,052
Uruguay[8]*:*			
Montevideo	60,947	65,525	126,472

[1] Including western land frontier.
[2] Year ending March 31.
[3] Calendar year 1921.
[4] Year ending June 30.
[5] General trade.
[6] Calendar year 1919.
[7] Calendar year 1920.
[8] Real value of imports estimated on the basis of the official valuation.

TABLE 40—UNITED STATES. TONNAGE OF WATER-BORNE IMPORTS AND EXPORTS BY TRADE REGIONS AND INDIVIDUAL COUNTRIES *

(In Thousands of Cargo Tons of 2240 Pounds)

Foreign Origin or Destination	A Imports, 1923	B Exports, 1923
GRAND TOTAL	43,295.7	49,080.0
UNITED KINGDOM, TOTAL 2.8	2,610.7	7,301.8
England	1,974.5	6,157.8
Ireland	4.2	298.3
Scotland	230.3	677.0
Wales	401.7	168.8
NORTH ATLANTIC AND BALTIC EUROPE, TOTAL 1.1	1,584.7	1,705.8
Greenland	5.2	
Russia	.....	4.4
Finland	91.9	77.9
Norway	676.2	384.7
Sweden	717.5	306.1
Denmark	50.3	645.4
Danzig	2.0	112.9
Germany	40.2	135.0
Esthonia	.....	6.6
Latvia	1.4	32.8
HAVRE-HAMBURG RANGE, TOTAL 3.0	2,663.1	8,021.6
Germany	1,141.3	2,977.3
Netherlands	471.5	2,172.7
Belgium	826.5	1,491.4
France	273.7	1,380.1
SOUTH ATLANTIC EUROPE, TOTAL 3.2	41.6	1,564.9
France	53.3	1,198.3
Portugal	57.3	135.3
Spain	370.4	168.0
Azores Islands	.1	17.1
Canary Islands	.4	45.7
WEST MEDITERRANEAN, TOTAL 3.1	1,196.2	3,749.1
Spain	282.0	294.9
France	99.5	783.5
Italy	432.8	2,421.3
Yugoslavia	4.1	2.2
Malta	.....	33.8
Tunis	198.2	64.9
Algeria	179.7	137.5
Morocco	.....	5.7
EAST MEDITERRANEAN AND BLACK SEA, TOTAL 2.4	291.0	689.7
Russia	.....	7.9
Georgia	107.5	7.2
Turkey	32.6	84.0
Armenia	.....	6.9
Greece	64.8	414.2
Egypt	80.1	134.7
Palestine	.1	5.9
Syria	1.5	22.5
WEST INDIES, TOTAL 0.6	5,549.2	3,147.8
Cuba	4,778.7	2,364.6
Jamaica	237.5	126.3
Bahama Islands	48.4	32.7
Haiti	50.1	93.9
Dominican Republic	144.2	127.2
Lesser Antilles (Guadeloupe)	278.4	350.7
Bermuda	11.7	52.4
MEXICO 0.1	14,150.5	1,252.8
CENTRAL AMERICA, TOTAL 0.9	1,065.2	1,223.2
British Honduras	62.1	13.6
Guatemala	158.9	44.4
Honduras	292.7	107.0
Nicaragua	190.8	26.6
Costa Rica	124.6	36.7
Panama	80.9	3.6
Canal Zone	135.8	964.2
Salvador	19.4	27.1
NORTH COAST SOUTH AMERICA, TOTAL 0.5	367.5	192.8
Venezuela	83.4	70.4
British Guiana	104.1	16.8
Dutch Guiana	14.3	10.0
Colombia	165.4	93.2
EAST COAST SOUTH AMERICA, TOTAL 1.4	1,613.4	2,291.3
Brazil	686.0	697.0
Uruguay	62.8	198.2
Argentina	849.5	1,396.1
WEST COAST SOUTH AMERICA, TOTAL 0.4	2,031.4	853.1
Colombia	16.5	20.1
Chile	1,782.4	588.9
Peru	209.4	222.3
Ecuador	23.1	21.8
WEST AFRICA, TOTAL 0.7	197.6	139.9
Morocco	.6	34.1
French West Africa	31.2	26.4
British West Africa	115.8	28.6
Belgian Congo	8.3	3.6
SOUTH AND EAST AFRICA, TOTAL 2.0	128.3	257.2
Union of South Africa	38.5	192.5
Mozambique	84.0	52.3
British East Africa	1.9	6.0
Madagascar	4.0	1.9
AUSTRALASIA, TOTAL 5.7	169.3	965.7
New Zealand	28.8	170.0
Australia	109.3	777.7
Fiji Islands	5.3	3.3
Society Islands	11.5	7.7
Tasmania	.8	5.8
EAST INDIES, TOTAL 0.6	442.5	276.8
Straits Settlements	256.4	104.1
French Indo-China	10.1	50.2
Sumatra	44.4	8.7
Java	110.5	103.5
Celebes	9.1	5.1
Other islands	12.0	5.3
ORIENT, TOTAL 4.6	1,121.1	5,081.9
China	337.7	1,636.5
Japan	252.5	3,008.0
Philippine Islands	530.9	437.2
INDIA, PERSIAN GULF, AND RED SEA, TOTAL 0.5	665.8	361.7
Mesopotamia	17.1	
Arabia	2.2	12.5
India	576.4	321.8
Ceylon	70.1	27.4
CANADA, TOTAL 1.4	6,966.5	10,003.1
Pacific ports	1,053.6	677.0
Atlantic ports	1,000.9	959.0
Great Lakes ports	4,912.1	8,367.1

* Note that a country may appear in part under one trade region and in part under another. Minor countries are omitted, but their trade is included in regional totals. The numbers after or below the names of the trade regions indicate the ratio between exports and imports, for *the region as a whole.*

TABLE 41—UNITED STATES. IMPORTS AND EXPORTS BY CUSTOMS DISTRICTS, 1923

(Name of Chief Port in Parentheses)

	A Imports, Millions of Dollars	B Imports, Thousands of Tons	C Exports, Millions of Dollars	D Exports, Thousands of Tons
Maine and New Hampshire (Portland)	26.3	397.8	17.4	620.4
Massachusetts (Boston)	307.3	3,238.8	52.2	492.8
Rhode Island (Providence)	11.8	837.6	.1	0.5
Connecticut (New Haven)	9.5	52.3	0.7	6.7
New York (New York)	1,797.8	11,559.2	1,518.9	11,023.2
Philadelphia	219.7	4,090.9	106.5	2,436.8
Maryland (Baltimore	91.8	3,412.8	93.4	3,204.9
Virginia (Norfolk)	15.0	468.6	183.2	2,955.8
North Carolina (Wilmington)	10.7	190.1	15.1	18.8
South Carolina (Charleston)	7.9	373.2	25.5	325.3
Georgia (Savannah)	28.9	533.3	51.5	248.4
Florida (Tampa)	20.0	1,000.4	65.4	1,769.6
Mobile	3.6	320.6	39.6	935.2
New Orleans	171.6	4,172.2	301.4	3,044.1
Sabine, Texas	9.3	1,767.6	55.0	1,354.6
Galveston	33.0	1,992.1	530.5	1,678.4
San Antonio	3.0	.....	37.0	
El Paso	4.1	.....	11.5	
Arizona	13.0	.....	11.1	
Los Angeles	32.5	494.0	39.6	2,294.1
San Francisco	166.7	950.3	160.4	2,148.8
Oregon (Portland)	10.1	117.7	52.5	1,394.3
Washington (Seattle)	262.2	931.8	116.1	1,759 3
Montana and Idaho	3.9	.....	3.3	
Dakota	26.3	.....	43.8	
Wisconsin (Milwaukee)	5.0	2.0	1.5	40.3
Duluth and Superior (Superior)	18.8	204.7	34.3	1,222.8
Chicago	45.6	25.6	14.0	281.4
Michigan (Marquette)	90.0	77.0	226.6	573.8
Ohio (Cleveland)	17.7	1,113.5	37.3	4,838.0
Buffalo	70.3	3,108.8	178.8	227.6
Rochester	6.1	142.6	10.5	1,134.2
St. Lawrence	160.0	148.3	78.7	17.5
Vermont	43.2	.....	45.4	

TABLE 42—UNITED STATES. PRINCIPAL COMMODITIES IN FOREIGN TRADE WITH THE PRINCIPAL COUNTRIES OF THE WORLD, 1924

Country and Commodity	Values, Millions of Dollars
British India and Indies	
Exports from United States	44
Petroleum products	10
Imports into United States	277
Rubber, crude	110
Burlaps	49
Tin	48
Shellac	12
Jute and jute products	10
Tea	8
Goat and kid skins	6
Castor beans	3
China, Including Hong-Kong and Kwantung	
Exports from United States	135
Petroleum products	26
Tobacco, leaf	17
Wheat	16
Cigarettes	15
Copper, refined	8
Tinplate, etc.	4
Cotton, unmanufactured	3
Imports into United States	137
Silk, raw	31
Carpet wool	14
Chinese wood oil or nut oil	11
Furs, undressed	11
Bristles	6
Carpets	5
Cotton, manufactured	5
Goat and kid skins	3
Japan	
Exports from United States	250
Cotton, manufactured	95
Petroleum and petroleum products	15
Iron and steel products	12
Wheat	10
Tinplate, etc.	7
Lumber	6
Tobacco, leaf	5
Automobiles	5
Copper, refined	3
Imports into United States	340
Silk, raw	286
Silk, fabrics	8
Tea	6
Decorated china	3
Philippine Islands	
Exports from United States	60
Cotton cloth	9
Wheat flour	4
Petroleum products	4

Country and Commodity	Values, Millions of Dollars
Philippine Islands—*Cont.*	
Imports into United States	97
Sugar	39
Coconut oil	17
Manila hemp	14
Copra	11
Cigars and cheroots	5
Australia	
Exports from United States	125
Automobiles, including parts	34
Petroleum products	20
Tobacco, leaf	8
Lumber	6
Wheel tractors	3
Imports into United States	33
Combing wool	20
Furs, undressed	6
Belgium	
Exports from United States	116
Cotton, unmanufactured	24
Wheat	17
Copper, refined	11
Petroleum products	10
Pork and pork products	6
Tobacco, leaf	3
Imports into United States	66
Diamonds, cut but not set	24
Glass	7
Furs, undressed	4
Denmark	
Exports from United States	43
Automobile parts and chassis	8
Cottonseed cake	6
Petroleum products	4
Cotton, unmanufactured	4
Imports into United States	6
Butter and butter substitutes	3
France	
Exports from United States	282
Cotton, unmanufactured	114
Petroleum products	49
Copper, refined	27
Wheat	10
Tobacco, leaf	6
Pork and pork products	4
Sugar	3

TABLE 42—UNITED STATES. PRINCIPAL COMMODITIES IN FOREIGN TRADE—*Continued*

Country and Commodity	Values, Millions of Dollars
FRANCE—*Cont.*	
Imports into United States	148
Cotton cloth and laces	9
Silk fabrics and wearing apparel	8
Walnuts	5
Pearls, not strung	4
Gloves, leather	4
Gold and silver threads and laces, etc.	4
Cigarette paper	3
Cotton sewing thread	3
Vanilla beans	3
GERMANY	
Exports from United States	441
Cotton, unmanufactured	224
Pork and pork products	47
Copper, refined	29
Wheat	21
Petroleum products	13
Tobacco, leaf	7
Milk, condensed	5
Furs, undressed	5
Barley	5
Rye	5
Prunes	4
Imports into United States	139
Furs, undressed	6
Toys	4
Chemical wood pulp	4
Decorated china	4
Cotton gloves	4
Cotton laces and hosiery	4
ITALY	
Exports from United States	187
Cotton, unmanufactured	84
Wheat	23
Petroleum products	15
Copper, refined	15
Pork and pork products	12
Coal, bituminous	4
Tobacco, leaf	4
Imports into United States	75
Cheese	9
Olive oil, edible	9
Silk, raw	7
Almonds, walnuts and filberts	5
NETHERLANDS	
Exports from United States	152
Wheat	33
Cotton, unmanufactured	17
Pork and pork products	12
Linseed cake	9
Copper, refined	8
Petroleum products	8
Oleo oil	7
Tobacco, leaf	6
Rye	3

Country and Commodity	Values, Millions of Dollars
NETHERLANDS—*Cont.*	
Imports into United States	74
Diamonds, cut but not set	21
Tobacco, leaf for wrappers	15
Bulbs, roots and corms	5
NORWAY	
Exports from United States	23
Imports into United States	21
Chemical wood pulp	5
Fish, packed in oil	4
Aluminum	4
SWEDEN	
Exports from United States	42
Cotton, unmanufactured	9
Petroleum products	4
Copper, refined	4
Imports into United States	40
Chemical wood pulp	23
Standard newsprint	4
UNITED KINGDOM	
Exports from United States	982
Cotton, unmanufactured	272
Pork and pork products	84
Tobacco, leaf	84
Petroleum products	82
Wheat	65
Copper, refined	3
Canned fruits	17
Barley	13
Furs, undressed	11
Leather (upper)	8
Sugar, refined	7
Salmon, canned	6
Zinc, pig	6
Spirits of turpentine	6
Corn	4
Imports into United States	366
Cotton cloth	31
Rubber, crude	22
Furs, undressed	18
Wool yarns and fabrics	18
Tin, in bars, etc.	13
Carpet wool	12
Combing wool	10
Creosote oil	9
Burlaps	8
Tea	7
Sheep and lamb skins	4
Clothing wool	3

TABLE 42.—UNITED STATES. PRINCIPAL COMMODITIES IN FOREIGN TRADE—*Continued*

Country and Commodity	Values, Millions of Dollars
CANADA	
Exports from United States	624
Wheat	73
Coal, bituminous	51
Coal, anthracite	39
Petroleum and petroleum products	31
Rye	26
Cotton, unmanufactured	23
Iron and steel products	9
Automobiles	8
Oranges	8
Corn	6
Copper, refined	6
Cotton cloth	6
Tobacco, leaf	5
Furs, undressed	3
Binder twine	3
Tin plate, etc.	3
Imports into United States	399
Standard newsprint	91
Lumber	74
Pulp and pulp wood	49
Wheat	16
Furs, undressed	12
Copper, unrefined	10
Dairy products	9
Flaxseed	6
Cattle	4
Cattle hides	4
CUBA	
Exports from United States	200
Pork and pork products	19
Cotton cloth and clothing	16
Wheat	8
Boots and shoes	7
Lumber	5
Milk, condensed	4
Sugar mill machinery	4
Automobiles	4
Eggs, in shell	3
Petroleum, crude	3
Coffee, green	3
Potatoes, white	3
Corn	3
Coal, bituminous	3
Imports into United States	362
Sugar	313
Tobacco, cigar leaf	23
Molasses	7
Pineapples	3
Copper, unrefined	3
MEXICO	
Exports from United States	135
Petroleum and petroleum products	6
Lard	6
Automobiles	5
Wheat	4
Cotton cloth	4
MEXICO—*Cont.*	
Imports into United States	167
Petroleum and petroleum products	90
Lead	12
Copper, unrefined	12
Sisal, unmanufactured	11
Cotton, unmanufactured	8
Coffee	5
Sugar, cane	5
Chicle	3
ARGENTINA	
Exports from United States	117
Automobiles, including parts	17
Petroleum and petroleum products	12
Lumber	10
Farm machinery	8
Cotton cloth	3
Sugar	3
Imports into United States	75
Flaxseed	24
Cattle hides	15
Combing wool	7
Sheep and lamb skins	3
BRAZIL	
Exports from United States	65
Petroleum products	12
Automobiles, including parts	10
Wheat	4
Coal, bituminous	4
Imports into United States	179
Coffee	158
Rubber, crude	5
Cocoa or cacoa beans	5
Brazil nuts	3
CHILE	
Exports from United States	31
Petroleum products	6
Cotton cloth	3
Imports into United States	99
Sodium nitrate	47
Copper, unrefined	22
Copper, refined	18
Iron ore	7
COLOMBIA	
Exports from United States	29
Cotton cloth	5
Imports into United States	58
Coffee	49
Platinum, unmanufactured	4

TABLE 43—UNITED STATES. PRINCIPAL EXPORTS BY LEADING COUNTRIES OF DESTINATION, 1924

Commodity, and Country of Destination	Value, Millions of Dollars
COTTON, UNMANUFACTURED, TOTAL	951
United Kingdom	272
Germany	224
France	114
Japan	95
Italy	84
Russia	37
Spain	36
WHEAT, GRAIN, TOTAL	237
Canada	73
United Kingdom	54
Italy	23
Netherlands	20
Belgium	17
France	10
Germany	10
Japan	9
GASOLINE AND NAPHTHA, TOTAL	168
United Kingdom	47
France	30
Australia	13
Canada	9
New Zealand	7
Brazil	6
Argentina	5
LEAF TOBACCO, TOTAL	163
United Kingdom	84
China	17
Australia	8
Germany	7
France	6
Netherlands	6
Japan	5
Canada	5
Italy	4
COPPER, REFINED, TOTAL	147
United Kingdom	33
Germany	29
France	27
Italy	15
Belgium	11
China	8
Netherlands	8
AUTOMOBILES AND TRUCKS, TOTAL	132
Australia	31
Canada	10
Argentina	10
British South Africa	7
United Kingdom	6
Mexico	6
Cuba	5
Japan	5
Spain	5
Brazil	4
LARD, TOTAL	126
Germany	41
United Kingdom	31
Cuba	13
Netherlands	9
Italy	9
Mexico	6
Belgium	4
France	3
WHEAT, FLOUR, TOTAL	91
Netherlands	12
United Kingdom	11
Germany	11
Cuba	8
China	6
Hong-Kong	5
Brazil	4
HAMS, SHOULDERS AND BACON, TOTAL	91
United Kingdom	53
Cuba	6
Germany	6
Belgium	3
ILLUMINATING OIL, TOTAL	88
China	20
United Kingdom	9
British India	6
France	6
Netherlands	4
Brazil	4
Australia	4
Japan	3
LUBRICATING OIL, TOTAL	87
United Kingdom	19
France	13
Germany	6
Belgium	5
Italy	5
COTTON CLOTH, TOTAL	74
Cuba	13
Philippine Islands	9
Central America	9
Canada	6
Colombia	5
Haiti	4
Mexico	4
Argentina	3
Chile	3
COAL, BITUMINOUS	71
Canada	51
Italy	4
Brazil	4
Cuba	3
FUEL AND GAS OIL, TOTAL	49
United Kingdom	7
Chile	6
Japan	5
Canada	5
Panama	5
Mexico	4
Italy	3
COAL, ANTHRACITE, TOTAL	40
Canada	39
RYE, GRAIN, TOTAL	39
Canada	26
Germany	5
Netherlands	3
SUGAR, REFINED, TOTAL	24
United Kingdom	7
Uruguay	3
France	3
CIGARETTES, TOTAL	19
China	13
CORN, GRAIN, TOTAL	18
Canada	6
United Kingdom	4

TABLE 44—UNITED STATES. PRINCIPAL IMPORTS BY LEADING COUNTRIES OF ORIGIN, 1924

Commodity, and Country of Origin	Value, Millions of Dollars
SUGAR, CANE, TOTAL	364
Cuba	313
Philippine Islands	39
SILK, RAW, TOTAL	328
Japan	286
China	26
Italy	7
COFEE, TOTAL	249
Brazil	158
Colombia	49
Venezuela	13
Guatemala	7
Mexico	5
RUBBER, CRUDE, TOTAL	174
British East Indies	110
Dutch East Indies	33
United Kingdom	22
Brazil	5
STANDARD NEWS PRINT, TOTAL	101
Canada	91
Sweden	4
WOOL, UNMANUFACTURED, TOTAL	91
United Kingdom	25
Australia	21
China	15
Argentina	11
Uruguay	4
British South Africa	3
PULP AND PULPWOOD	82
Canada	42
Sweden	23
Norway	5
Finland	3
FURS, UNDRESSED, TOTAL	80
United Kingdom	18
Canada	12
China	11
Germany	6
Australia	6
Belgium	4
COPPER, UNREFINED	77
Chile	22
Portuguese Africa	15
Mexico	12
Canada	10
Peru	10
Cuba	3
TOBACCO, LEAF, TOTAL	75
Cuba	23
Greece	23
Netherlands	15
Turkey	5
CRUDE PETROLEUM, TOTAL	74
Mexico	67
CRUDE TIN	69
Straits Settlements	48
United Kingdom	13
BURLAPS, TOTAL	59
British India	49
United Kingdom	8
LUMBER	52
Canada	51
COTTON, UNMANUFACTURED	49
Egypt	28
Mexico	8
China	5
British India	4
DIAMONDS, CUT BUT NOT SET	47
Belgium	24
Netherlands	21
SODIUM NITRATE	47
Chile	47
COTTON CLOTH, TOTAL	38
United Kingdom	31
FLAXSEED, TOTAL	30
Argentina	24
Canada	6
COCOA, TOTAL	29
British West Africa	8
Ecuador	5
Brazil	5
British West Indies	3
Dominican Republic	3
TEA, TOTAL	27
British East Indies	8
United Kingdom	7
Japan	6
CATTLE HIDES, TOTAL	24
Argentina	15
Canada	4
GOAT AND KID SKINS, TOTAL	21
British India	6
China	3
CHEESE AND SUBSTITUTES, TOTAL	17
Italy	9
Switzerland	5
SHEEP AND LAMBSKINS, TOTAL	16
New Zealand	4
United Kingdom	4
Argentina	3
WHEAT, GRAIN, TOTAL	16
Canada	16

TABLE 45.—UNITED STATES. FINANCIAL CONDITIONS

State	A Average Wages of Farm Laborers, 1919, per Month	B Average Yearly Earnings of Wage Earners in Manufacturing, 1919	C Estimated Value of All Property per Capita, 1922	D Average Income per Capita, 1919–1921
Alabama	$36.50	$ 917	$1,244	$291
Arizona	83.00	1,318	3,512	640
Arkansas	45.60	946	1,439	306
California	91.20	1,250	4,007	909
Colorado	81.00	1,220	3,285	670
Connecticut	71.00	1,110	3,614	724
Delaware	50.50	1,280	2,728	656
Florida	45.00	905	2,358	402
Georgia	38.50	830	1,306	322
Idaho	93.60	1,330	3,301	549
Illinois	58.50	1,230	3,295	764
Indiana	53.30	1,140	2,942	540
Iowa	71.43	1,020	4,270	524
Kansas	65.50	1,200	3,493	546
Kentucky	46.00	970	1,459	372
Louisiana	43.10	960	1,855	395
Maine	70.00	1,060	2,586	569
Maryland	49.00	1,050	2,665	670
Massachusetts	71.00	1,130	3,243	835
Michigan	60.00	1,360	2,899	659
Minnesota	75.00	1,100	3,442	530
Mississippi	38.00	895	1,216	263
Missouri	50.90	1,010	2,903	542
Montana	89.00	1,440	3,691	573
Nebraska	77.50	1,260	4,004	516
Nevada	93 00	1,390	6,998	874
New Hampshire	69.70	955	3,074	612
New Jersey	67.00	1,180	3,524	745
New Mexico	59.20	1,160	2,299	445
New York	62.50	1,200	3,436	943
North Carolina	45.00	805	1,703	329
North Dakota	79.30	1,210	3,692	426
Ohio	56.20	1,295	3,048	650
Oklahoma	60.60	1,190	1,864	456
Oregon	87.00	1,385	4,182	710
Pennsylvania	59.00	1,240	3,187	687
Rhode Island	73.00	985	3,086	783
South Carolina	38.40	790	1,385	312
South Dakota	88.00	1,240	4,482	500
Tennessee	41.40	855	1,773	336
Texas	55.20	1,080	2,010	497
Utah	92.00	1,140	3,247	514
Vermont	65.00	1,020	2,389	544
Virginia	45.00	1,010	2,050	389
Washington	91.00	1,470	3,600	710
West Virginia	58.00	1,225	3,040	474
Wisconsin	69.00	1,095	2,887	562
Wyoming	86.10	1,680	4,663	826

TABLE 46.—UNITED STATES: VITAL STATISTICS

State	A	B	C	D	E	F	G
	Births per 1,000 Persons, 1922–24	Refined Death Rate † per 1,000 Persons (1920–1922)				Crude Urban Death Rate ‡ 1922–24	Deaths of Infants per 1,000 Births, 1922–24
		State	Cities Over 100,000	Rest of State	Per Cent Excess of Cities Over Rest		
California	21.0	12.3	12.9	12.0	8	14.3	70
Colorado	.....	13.3	14.8	12.8	16	15.7	
Connecticut	21.1	11.7	12.2	11.4	7	11.8	74
Delaware	19.7	13.0	13.1	12.9	2	12.3	97
Florida	24.2*	12.2	.....	12.2	.....	15.9	93
Illinois	19.8	11.5	12.5	11.1	13	11.8	80
Indiana	21.8	11.2	13.2	11.0	20	12.5	76
Iowa	18.6*	.....	.....	.....	.....	12.9	
Kansas	21.7*	9.8	13.2	9.6	38	13.4	79
Kentucky	25.4*	11.0	14.4	10.6	36	15.6	87
Louisiana	.....	12.4	16.3	11.3	40	17.5	
Maine	22.9	11.9	.....	11.9	.....	15.7	91
Maryland	23.0	13.4	13.7	13.0	5	14.5	88
Massachusetts	22.1*	12.0	13.1	11.3	16	12.4	80
Michigan	.....	11.7	12.8	11.2	14	11.5	
Minnesota	22.5	9.3	10.1	9.1	11	12.1	59
Mississippi	24.0	12.5	.....	12.5	.....	21.4	89
Missouri	.....	11.0	13.7	9.8	35	13.9	
Montana	17.2	9.4	.....	9.4	.....	13.0	74
Nebraska	22.5	9.2	12.5	8.7	44	13.0	70
New Hampshire	21.7	11.5	.....	11.5	.....	14.0	91
New Jersey	22.3	12.3	13.3	11.8	12	11.8	73
New York	21.3	12.7	13.1	11.9	10	12.3	73
North Carolina	31.3	12.5	.....	12.5	.....	16.1	102
North Dakota	20.8*	.....	.....	.....	.....	12.5	68
Ohio	20.8	11.0	12.2	10.3	18	11.4	75
Oregon	18.4	10.1	10.1	10.1	.....	13.0	55
Pennsylvania	24.0	12.7	13.3	12.5	6	13.6	85
Rhode Island	23.1*	13.1	13.3	12.9	3	13.6	83
South Carolina	26.4	14.1	.....	14.1	.....	21.1	114
Tennessee	.....	11.4	16.9	10.6	59	17.7	
Utah	29.6*	10.8	10.6	10.9	−3	12.5	72
Vermont	21.0	11.8	.....	11.8	.....	16.1	90
Virginia	26.9	12.9	15.0	12.6	19	13.6	95
Washington	17.6	10.1	9.9	10.2	−3	10.5	54
Wisconsin	21.2	9.9	10.7	9.3	15	11.2	74
Wyoming	24.2	.....	.....	.....	.....	14.2	93

* Numbers marked with an asterisk are based on less than three years.

†A refined death rate is one where allowance is made for proportions of young *vs.* old people in population and for deaths of non-residents.

‡ Includes all places having a population of 10,000 or more. Thus column F represents a less homogeneous type of population than column C, but a more homogeneous type than D which includes many cities as well as all the truly rural districts, or than B which includes everything.

TABLE 47.—UNITED STATES. DEATH RATE, CLIMATE, RACE, AND SOCIAL AND ECONOMIC CONDITIONS IN CITIES

Registration Cities of 100,000 Population or More, in 1920	A Refined[1] Death Rate per 1000, All Causes, Average 1920–24	B Refined[2] Death Rate per 1000 Whites, All Causes, Average 1920–22	C Mean July Temperature Deg. F	D Mean January Temperature Deg. F	E Mean Annual Rainfall Ins.	F Per Cent of Negroes in Total Population, 1920	G Per Cent of Population Engaged in Manufacturing, 1920	H Persons per Dwelling	I Percentage of Illiteracy Among Persons over 10 Years of Age	J Average Cost of Food per Family, 1923
Birmingham, Ala.	15.0*	10.8	80.2	45.1	48.6	39.3	35.0	5.1	8.4	$405
Los Angeles, Calif.	13.5*	13.5	70.2	54.6	15.8	2.7	31.6	4.6	2.0	390
Oakland, Calif.	11.0	11.1	62.4	48.1	24.0	2.5	39.3	4.6	2.5	
San Francisco, Calif.	12.9	13.1	58.5	49.9	22.4	0.5	30.9	5.6	1.9	376
Denver, Colo.	14.8*	14.8	72.2	29.8	14.0	2.4	28.2	5.1	1.9	347
Bridgeport, Conn.	12.0*	12.0	71.4	31.0	46.5	1.6	60.3	6.4	6.9	408
Hartford, Conn.	11.6	12.3	71.6	25.5	45.4	3.0	45.0	8.4	5.1	
New Haven, Conn.	12.1	12.3	71.9	27.3	47.3	2.8	46.3	7.2	6.3	411
Wilmington, Del.	13.0	13.1	76.8	32.8	44.4	9.8	48.7	5.3	5.5	
Washington, D. C.	14.1	11.7	76.8	33.7	43.6	25.1	18.9	6.1	2.8	400
Atlanta, Ga.	16.4*	12.7	78.4	43.0	49.3	31.3	27.7	5.3	6.6	399
Chicago, Ill.	12.4	12.5	73.9	25.1	33.3	4.1	39.7	8.0	4.6	378
Indianapolis, Ind.	13.3	12.2	75.7	28.4	41.5	11.0	43.7	4.4	2.1	362
Kansas City, Kans.	13.4	12.2[1]	78.1	28.2	37.4	14.2	46.8	4.5	3.7	
Louisville, Ky.	14.9	12.8?	76.0	34.4	44.4	17.1	39.8	5.0	4.0	350
New Orleans, La.	16.3*	13.4	82.4	54.2	57.5	26.1	32.0	5.0	5.9	364
Baltimore, Md.	13.8	12.2	77.4	34.0	43.3	14.8	42.4	5.4	4.4	375
Boston, Mass.	13.0	13.0	71.7	27.0	42.0	2.2	37.0	9.4	4.0	425
Cambridge, Mass.	13.4	13.6	71.7	27.0	43.0	4.9	42.5	7.3	3.1	
Fall River, Mass.	14.8	15.4	70.7	28.7	44.0	0.3	71.5	8.7	11.9	410
Lowell, Mass.	14.2	14.2	71.5	23.8	44.9	0.2	67.4	6.4	6.9	
New Bedford, Mass.	12.7	13.2	69.4	28.0	46.2	4.1	72.0	8.1	12.1	
Springfield, Mass.	10.7	10.8	73.2	25.0	44.5	2.0	46.8	6.8	3.7	
Worcester, Mass.	12.0	12.2	71.4	24.8	42.7	0.7	54.0	9.3	4.7	
Detroit, Mich.	13.1*	13.1	72.1	24.4	32.2	4.1	56.3	6.5	3.8	375
Grand Rapids, Mich.	10.7	10.9	72.6	23.8	31.5	0.8	49.7	4.7	3.3	
Minneapolis, Minn.	9.9	9.9	72.3	13.4	29.3	1.0	34.6	5.8	1.2	347
St. Paul, Minn.	10.6	10.4	72.1	12.6	28.7	1.4	34.9	5.5	1.6	346
Kansas City, Mo.	14.9*	14.9	78.1	28.2	37.4	9.5	29.1	5.3	2.0	361
St. Louis, Mo.	13.1	13.1	78.6	30.8	37.3	9.0	40.7	6.5	2.7	359
Omaha, Neb.	12.2	12.5	76.7	21.9	30.7	5.4	34.8	5.0	2.5	359
Camden, N. J.	13.4	13.2	76.5	.....	32.7	7.3	58.8	4.7	5.0	
Jersey City, N. J.	13.6	13.8	76.1	32.2	45.9	2.7	40.7	9.6	4.3	
Newark, N. J.	12.9	12.9	74.6	29.8	47.6	4.1	52.5	10.0	6.0	403
Paterson, N. J.	12.5	12.6	74.4	29.6	49.9	1.1	64.0	7.2	6.3	
Trenton, N. J.	14.1	14.4	74.5	30.5	44.6	3.6	57.7	5.3	6.9	
Albany, N. Y.	12.8	12.7	72.6	23.1	36.5	1.1	33.3	6.2	3.0	
Buffalo, N. Y.	13.6	13.7	69.8	24.6	37.4	0.9	45.8	6.9	4.2	376
New York, N. Y.	13.1	13.2	73.8	30.9	44.8	2.7	37.6	15.4	6.2	409
Rochester, N. Y.	11.2	11.5	70.7	24.6	34.3	0.5	54.0	5.2	4.5	373
Syracuse, N. Y.	12.0	12.4	70.8	23.0	34.3	0.7	47.0	6.0	4.0	
Yonkers, N. Y.	11.6	12.1	.....	.....	.....	1.9	45.3	9.7	5.5	
Akron, Ohio	10.6*	10.6	72.5	27.0	36.8	2.7	65.9	6.5	3.5	
Cincinnati, Ohio	13.7	13.5	75.7	30.3	38.3	7.5	43.8	6.4	2.0	358
Cleveland, Ohio	11.9	12.2	71.4	26.7	35.1	4.3	52.9	6.8	5.3	407
Columbus, Ohio	12.4	12.1	74.9	28.5	36.9	9.4	40.1	4.6	2.8	359
Dayton, Ohio	11.2	11.2	76.0	29.6	38.4	5.9	52.8	4.5	1.9	
Toledo, Ohio	12.2	12.3	73.2	25.8	32.2	2.3	48.3	4.9	2.5	
Youngstown, Ohio	12.4	12.8	72.3	27.1	33.5	5.0	53.4	5.5	5.7	
Portland, Ore.	10.0	10.1	66.7	39.4	43.4	0.6	35.9	4.7	1.7	355
Philadelphia, Pa.	13.5	13.5	76.2	32.6	33.3	7.4	47.5	5.2	4.0	387
Pittsburgh, Pa.	14.9	14.6	74.7	29.5	36.2	6.4	40.1	6.3	4.3	393
Reading, Pa.	12.8	12.8	75.5	29.4	41.0	0.9	63.5	4.7	3.5	
Scranton, Pa.	14.5	14.7	71.7	25.5	37.6	0.4	32.2	5.8	6.5	401
Providence, R. I.	13.3*	13.3	72.0	29.0	44.2	2.4	53.1	6.7	5.9	423
Memphis, Tenn.	17.1*	12.6	80.7	40.9	50.5	37.7	28.2	4.6	6.7	373
Nashville, Tenn.	16.6*	14.2	79.1	38.6	48.6	30.1	32.2	4.7	7.2	
Dallas, Texas	12.5*	11.1	84.1	45.2	37.7	15.1	24.9	5.2	3.2	394
Houston, Texas	14.9*	13.0	83.7	53.5	47.6	24.6	30.2	4.9	5.4	363
San Antonio, Texas	16.3*	16.3	83.8	51.1	26.9	8.9	25.1	5.3	11.4	
Salt Lake City, Utah	10.6	10.6	75.7	29.2	16.0	0.6	27.9	5.0	1.0	336
Norfolk, Va.	13.7	11.0	78.7	40.6	49.7	37.5	28.3	5.8	6.3	380
Richmond, Va.	15.3	11.8	78.5	37.9	41.7	31.5	38.7	5.6	5.6	424
Seattle, Wash.	9.5	9.5	63.1	39.5	34.2	0.9	36.9	5.2	1.5	365
Spokane, Wash.	11.1*	11.1	69.0	27.5	17.9	0.7	27.3	4.7	0.8	
Milwaukee, Wis.	10.7	10.7	70.1	20.6	31.5	0.5	51.9	6.8	3.0	350

*Three-year average (1921–21–22).

[1] Data for 1920, 1921, and 1922 are from *Mortality Statistics*, 1922 (U. S. Bureau of the Census).—Data for 1923 and 1924 are estimated on the same basis from the crude rates.

[2] Where colored people form less than 10% of the population, death rates for white and colored are not given separately.

TABLE 48.—UNITED STATES. ILLITERACY AND EDUCATION, 1920

Among Persons Over 10 Years of Age.

State.	A. Per Cent Illiterate Among All Inhabitants Over 10 Years.	B. Per Cent Illiterate Among Native Whites of Native Parentage Over 10 Years.	C. Per Cent Illiterate Among Native Whites of Foreign or Mixed Parentage. Over 10 Years.	D. Per Cent Illiterate Among Foreign born Whites Over 10 Years.	E. Per Cent Illiterate Among Colored Persons Over 10 Years.	F. Per Cent Illiterate Among All Classes Over 10 Years. Urban.	G. Per Cent Illiterate Among All Classes Over 10 Years. Rural.	H. Percentage of Children 7–13 Years of Age in School.
Alabama	16.1	6.4	1.7	10.9	31.3	10.4	17.8	80.0
Arizona	5.3	1.3	4.6	27.5	4.6	6.5	20.4	78.8
Arkansas	9.4	4.6	2.0	8.3	21.8	4.9	10.3	82.0
California	3.3	0.4	0.5	10.5	4.7	2.4	5.4	93.7
Colorado	3.2	1.7	0.6	12.4	6.2	2.3	4.2	93.9
Connecticut	6.2	0.4	0.4	17.0	6.2	6.6	5.3	94.7
Delaware	5.9	2.0	0.6	17.3	19.1	5.7	6.1	95.2
Florida	9.6	3.1	1.1	6.3	21.5	5.4	12.2	83.2
Georgia	15.3	5.5	1.1	5.4	29.1	9.5	17.5	79.1
Idaho	1.5	0.3	0.3	6.5	5.4	1.4	1.5	95.5
Illinois	3.4	1.1	0.4	11.0	6.7	3.9	2.2	94.7
Indiana	2.2	1.4	1.0	11.8	9.5	2.6	1.8	94.9
Iowa	1.1	0.5	0.4	4.9	8.1	1.4	0.9	95.0
Kansas	1.6	0.6	0.5	10.5	8.8	2.0	1.4	94.5
Kentucky	8.4	7.3	1.3	7.3	21.0	5.1	9.8	88.5
Louisiana	21.9	11.4	3.5	21.9	38.5	9.1	29.6	75.9
Maine	3.3	1.3	2.9	11.1	5.9	3.5	3.1	94.2
Maryland	5.6	2.0	0.9	13.4	18.2	4.4	7.4	92.6
Massachusetts	4.7	0.3	0.5	12.8	6.8	4.8	3.0	96.1
Michigan	3.0	0.6	0.7	9.9	4.2	3.4	2.5	94.9
Minnesota	1.8	0.4	0.5	5.4	3.1	1.9	1.8	93.9
Mississippi	17.2	3.6	2.3	13.3	29.3	1.3	18.2	80.1
Missouri	3.0	2.2	0.9	9.6	12.1	2.6	3.5	93.4
Montana	2.3	0.3	0.3	5.6	6.0	1.6	2.6	92.8
Nebraska	1.4	0.4	0.4	6.4	4.8	2.0	1.0	93.9
Nevada	5.9	0.4	0.2	8.5	5.1	1.8	7.0	90.5
New Hampshire	4.4	0.6	1.1	15.4	6.7	5.3	2.8	93.4
New Jersey	5.1	0.7	0.4	15.3	6.1	5.3	4.6	94.9
New Mexico	15.6	11.9	8.2	27.1	4.3	7.1	17.6	87.4
New York	5.1	0.6	0.5	14.2	2.9	5.5	2.9	93.9
North Carolina	13.1	8.2	1.9	6.8	24.5	9.3	14.1	87.0
North Dakota	2.1	0.3	0.5	5.6	4.0	1.5	2.2	92.1
Ohio	2.8	1.0	0.6	12.6	8.1	3.2	2.2	96.0
Oklahoma	3.8	2.4	1.2	14.0	12.4	1.9	4.5	85.8
Oregon	1.5	0.4	0.3	5.1	4.7	1.5	1.4	94.7
Pennsylvania	4.6	0.8	0.6	18.9	6.1	4.6	4.6	94.5
Rhode Island	6.5	0.5	0.9	16.5	10.2	6.5	5.7	95.6
South Carolina	18.1	6.6	1.0	6.2	29.3	10.3	20.0	87.1
South Dakota	1.7	0.3	0.5	4.7	5.2	1.1	1.8	93.5
Tennessee	10.3	7.4	1.5	8.3	22.4	7.0	11.6	85.3
Texas	8.3	2.2	9.4	33.8	17.8	6.5	9.3	83.7
Utah	1.9	0.3	0.3	6.3	4.6	1.3	2.5	95.5
Vermont	3.0	1.1	2.8	11.3	6.2	3.9	2.6	93.9
Virginia	11.2	6.1	1.0	7.1	23.5	7.1	13.0	84.8
Washington	1.7	0.3	0.3	4.7	4.0	1.5	2.0	94.7
West Virginia	6.4	4.8	1.5	24.0	15.3	3.2	7.6	89.1
Wisconsin	2.4	0.5	0.8	8.4	4.1	2.6	2.3	94.5
Wyoming	2.1	0.4	0.3	9.0	5.3	2.1	2.1	92.8

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